ENGINEERING SOCIETY
UNIVERSITY of TORONTO

1947

SIXTY-FIRST EDITION

TRANSACTIONS AND YEAR BOOK

The Engineering Institute of Canada

FOUNDED 1887

The Engineering Institute of Canada is a Dominion-wide professional organization made up of students and engineers in all classifications of engineering, to the number of 8,800. Thirty-seven percent of the membership consists of persons who are not more than 33 years of age.

The Institute operates through twenty-eight branches in the main centres of Canada. It publishes *The Engineering Journal,* a monthly technical journal, and it operates an Employment Service without charge to members or to employers. There is a large technical library of a comprehensive character which is available to all members.

Students may join in any year after registration at the university. The annual dues are only two dollars, and include the *Journal.* A Student member is legally entitled to place the letters S.E.I.C. after his name.

In Toronto, there is an active branch of the Institute, founded in 1890, which meets regularly in winter months. Associated with it is a Junior Section for all engineers up to the age of 35. Undergraduate engineers are welcome at all meetings.

FOR STUDENTS

The Institute awards annually a number of valuable prizes for students. Some of these are open to all students, others only to members of the Institute.

The Harry F. Bennett Educational Fund of the Institute provides for loans to students in need of financial assistance to complete their engineering studies.

The Institute is the national body devoted exclusively to the promotion of the professional and economic interests of Canadian engineers, and to the welfare of their community.

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Association of Professional Engineers

Province of Ontario

ATTENTION OF ENGINEERING STUDENTS

THE ASSOCIATION of Professional Engineers of the Province of Ontario is constituted by the Legislature of the Province of Ontario to govern the practice of professional engineering in this Province. In brief, no person is permitted to practice professional engineering or term himself an "engineer" (with certain exemptions as defined in the Act) unless he is a registered Member or Licensee of the Association.

Registration can be obtained by graduates of the faculty of Applied Science and Engineering, University of Toronto, holding the Degree of Bachelor of Applied Science in Engineering, as soon as they are able to submit evidence of satisfactory practical experience.

Provision is made in the Act that an undergraduate may be recorded with the Association while attending University, thereafter, submitting annually information as to his standing and additional engineering experience. When he has acquired the necessary practical experience, he may then apply for final rgistration, which gives him the right to call himself a Professional Engineer and to practise Professional Engineering. With the exception of persons exempted from the operation of the Act no one may use the title, "Professional Engineer" or "Engineer," or any title similar thereto unless he is a Member or Licensee of the Association.

A recorded undergraduate receives the publications of the Association and all reports and information that is distributed to members. He receives a card that may serve as an introduction to prospective employers.

The Association is keenly interested in the welfare of the Young Engineer and is awarding five Scholarships each year (totalling $675) to students in the Faculty of Applied Science and Engineering at the University of Toronto.

Any further information desired may be obtained from the Registrar of the Association.

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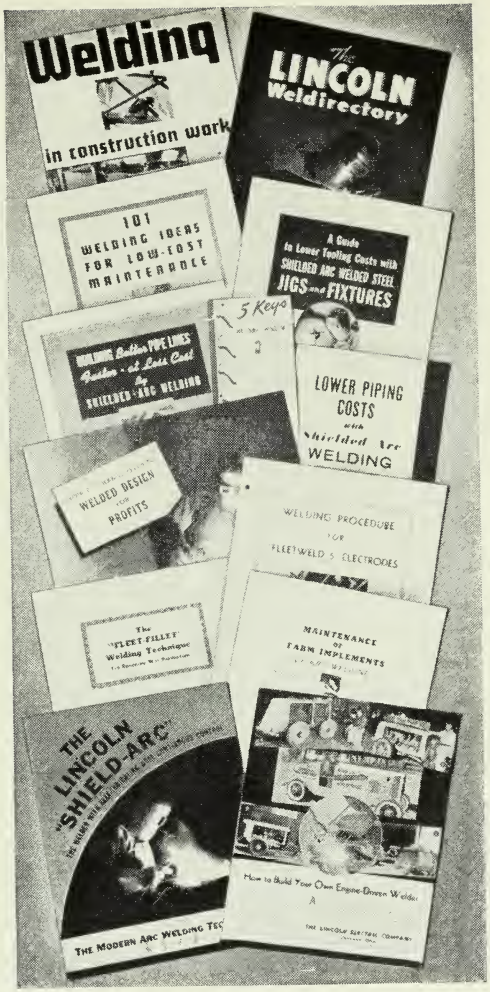

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Transactions
and
Year Book
1947

Engineering Society

The University of Toronto

JAMES ARTHUR NEWCOMBE

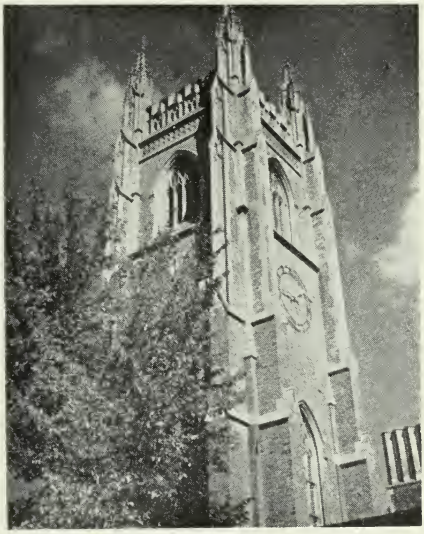
Professor of Physical Metallurgy - Died February 16th, 1947.

BORN AT KINGSTON-ON-THAMES, 56 YEARS AGO, JAMES ARTHUR Newcombe spent his early years in and around London. The war of 1914-18 found him employed as a technician in the Metallurgy Laboratory of the Royal Laboratory Department of the Ordnance Factory, Woolwich. He was drafted into the Army, but quickly returned to his important duties at the Ordnance Factory.

At the end of the war, at the age of 27, his outstanding abilities won him a scholarship at the Royal School of Mines, where he worked under the direction of Sir Harold Carpenter. He received his degree in due course and proceeded to the appointment of Lecturer at Liverpool University.

In 1925, he came to the Department of Metallurgical Engineering of this University in the capacity of Assistant Professor. He became an Associate Professor in 1930 and Professor of Metallurgical Engineering in 1942. In 1945, he was elected a Fellow of the Royal Institute of Chemistry.

Professor Newcombe will long be remembered as a fine teacher and a kind and intelligent gentleman. His sterling character, his keen sense of duty, his courage in affliction, and his unremitting devotion as a husband and father made Professor Newcombe a man of whom the University and the Country may well be proud.



TRANSACTIONS STAFF

L. R. J. D. Hisey; E. H. Hill; K. E. Hunter; J. J. R. Gray; D. H. Storey; T. L. Hennessy.

TRANSACTIONS and YEAR BOOK

of the

UNIVERSITY OF TORONTO ENGINEERING SOCIETY

No. 61 APRIL, 1947

Why "Arts" Courses in Engineering

An Editorial

The engineering students at the university of toronto have been taking various humanistic, or cultural if you wish, subjects for three years. Two complete classes have now gone through them and the time is appropriate for their evaluation. Are they paying their way? Would it be to the students' advantage to replace them with technical subjects or have they proved their worth?

The strongest argument against their continuance is, of course, that they contribute nothing to our technological training. If you examine this more closely, however, the fallacy is obvious. True, they make no technological contribution to our training, but to say they make no contribution to our technological training is analagous to the statement that the knowledge of how to put on one's shoes contributes nothing to one's ability to walk. You can walk, shoes or no shoes, but can you walk as far or with so sure a step?

A possible shortcoming of the courses as we know them is that we have little time to spend with literature on the subject and are therefore precluded from recognizing any way in which the professor may be biased. It is practically impossible to teach an abstract subject such as philosophy or economics without introducing some

personal convictions. This failing cannot be mitigated except by a careful choice of staff and by the refusal of the student to accept at face value whatever may be poured down his throat.

The value of these courses to us is not solely their own intrinsic worth but rather the insight they give us into the problems and the opportunities inherent in modern society.

The engineer, as a member of a profession, is motivated by two basic influences, personal gain and, to a greater or lesser degree, a curious sense of responsibility to mankind vested in him by virtue of his training. He cannot discharge this responsibility unless he appreciates what mankind requires of him and how he is best fitted to give it. This is the function of the humanistic courses.

Suppose we assume that the basic conception of teaching humanistic subjects to engineering students is a sound one. We are then faced with the question of whether the idea is being implemented in the best possible way. The success of the whole plan is wrapped up in this question. At the present time, the courses are being well taught in general. It is *imperative* that this standard should be maintained. Since our total knowledge of the subject in many cases, is derived from the lecture course, the lecturer must be excellent or the course is better abandoned.

It would be foolish to name specific ailing courses in this editorial but to ask for the correction of one glaring fault is entirely proper.

It is completely unnecessary to fail any substantial number of students in one of these subjects. The purpose of the course is to arouse our interest in the subject through attendance at a series of lectures. The number of failures will not appreciably affect the amount of preparation the student puts on the course. That time is too rigidly controlled by other influences. Is it not then absurd to pluck the student because he miscalculated the time required for study?

A great deal of the resentment against these courses is founded on simple fear. Take away this fear and appreciation of the courses will increase ten-fold. Without this appreciation the whole basis of their inclusion is an empty shell. Are they to be just another exam to be crammed for or are they to take their rightful place in enabling the engineer to understand and serve most competently the society in which he lives?

Dr. Sidney E. Smith

A MESSAGE TO THE GRADUATING CLASS

It has been my privilege to meet within the past two years many groups of graduates, from whom I have learned their litany of affection and loyalty for their Alma Mater. Nigh without fail there was shouted in those meetings, from many throats: "SKULE."

You are going forth to join these men and women who have contributed so much to the reputation of the Faculty of Applied Science and Engineering and the University, and who have built so much into our national fabric. You will become, moreover, members of no mean profession. What are the features which distinguish a profession from a trade or vocation? The members of a profession profess ideals which ennoble their characters and dignify their purposes to the end that they translate these ideals into honest and generous performance. A profession cannot be

established by order-in-council or by statute. It warrants its proud category by decades, and indeed centuries, of service above self, in which success, through shoddy methods and base means, is scorned. By virtue of your native ability and by reason of your training, you will be proficient and expert practitioners of your profession. You will insist on validating always your premises; you will proceed logically to your conclusions. For you, two plus two equals four.

Mankind is battered and distraught. Will you transfer, in obedience to the tested traditions of public service of your high profession, your training to the solution of social, economic and political problems which are vexing society? In no small measure the engineer and the physical scientist have the answer to the question: Will the forces of nature unleashed by them be a weapon for the suicide of humanity or a means for its salvation?

It may not be the lot of each of you to blare forth the answer to that awful question from some peak in full view of the public gaze. Yet your Alma Mater gives to every one of you the charge that, even amidst the daily routine in the remoteness of a mine, in the stillness of a draughting room or in the secrecy of a laboratory, you will strive without ceasing for the primary objective—the advancement of human relations.

Versed as you are in quantitative values, on which our new and expanding country to a marked degree has been built, may you be pioneers on the unexplored frontiers of qualitative values in human relationships.

We are sorry to see you leave the halls of the University. We are proud of you. We have an abiding confidence in you.

SIDNEY SMITH

THESE STUDENT YEARS

FEW UNDERGRADUATES AWAKEN TO THE FULL POSSIBILITIES OF student years until the time has come for them to leave academic halls. Many there are who with regret, not untinged with sadness, recall the opportunities that have been missed to develop an appreciation of those things that make for a full and balanced life.

The freshman entering a scientific or professional school is far too much obsessed with the desire to brush aside all else and acquire great masses of facts which will somehow or other make of him the master of every coming situation. He seeks to mechanize himself, erroneously believing that all things yield to the application of physical law. Thereby he halves his potentialities. As well might one seek to prevail in a physical contest by tying one hand behind one's back. It is scarcely the part of wisdom to impose barriers to one's own progress and achievement.

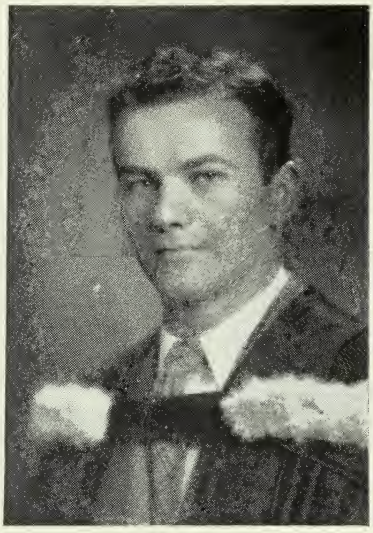
There is altogether too much intolerance of cultural considerations amongst men of science and technology. That intolerance

comes of ignorance, of flagrant disregard of how other men live and think, of lack of sympathy with those who have something to say that cannot be set down in mathematical equations. Not a little of it derives from sheer scientific arrogance. The man whose outlook is from the standpoint of the liberal arts may be a great deal nearer the secret of a satisfying and socially valuable life than the man who regards science and technology as the key to all mysteries.

It is to be regretted that more engineering undergraduates do not early acquire a fondness for the imperishables in literature, in art, in music, and in the drama. Getting an average engineer-in-training to express himself habitually, whether in speech or in writing, in clear, correct, graceful, imaginative English, free from colloquialisms, clichés, and vulgarities is a heroic adventure for anyone who undertakes it.

This is not a matter of idealistic and impracticable dreaming. It is of sober, practical consequence to the young man who hopes to go far in the profession and attain recognition as a leader in his time and community. Those who administer great organizations and select men for high enterprise invariably choose those who can in all settings represent them with distinction. The half-educated will not do.

C. R. Young,
Dean.



C. W. Daniel

ENGINEERING SOCIETY PRESIDENT'S ADDRESS

This year the Engineering Society was again divided between two campi. However, this division was only a physical one, and the thirty miles between the Queen's Park campus and Ajax campus did not keep fellow schoolmen apart.

From the beginning, it was the objective of the Engineering Society Executives, to have as many combined functions as possible this year.

The first of these was the Annual School Dinner, the fifty-seventh, held in the Recreation Hall at Ajax. This was the first time in many years that the dinner was taken from Hart House but the magnitude of the enrolment called for a larger dining hall and Ajax supplied this. The guest of honour was Mr. Leonard W. Brockington, K.C., one of the best-known after dinner speakers in Canada, who gave an inspiring talk on "The Future of Canadian Engineers." The dinner was originally planned for Mr. D. C. Coleman, President of the Canadian Pacific Railway, but illness prevented Mr. Coleman from being with us.

The second combined effort was seen in "School Nite" where Jim Brown, Chairman of the School Nite Committee, and his able followers did the impossible in producing, not one, but two School Nite Revues. They were held on two consecutive Friday evenings in Hart House Theatre, with all the trimmings for both shows. The first night was "Ajax" night, the second "Toronto" night, and spirit ran high at both of these great shows. Bill Flanagan, Revue Director, deserves many handshakes for the excellent job in producing the show and overcoming numerous obstacles. Also Ramsay Saba, Stage Crew Director, deserves the highest praise from everyone at "School" for his outstanding work.

Ajax and Toronto Schoolmen again met at the "School At-Home," this time at the Royal York Hotel. This was THE party of the year, a crowning achievement to the untiring efforts of Jim Brown and his committee. This event will live long in the memories of Schoolmen. The entire convention floor of the Royal York was trampled underfoot, as the music of Ellis McLintock and Frank Bogart set us rocking. The outstanding feature of the dance was the wide variety of novelties and special dances. These included decorations designed and produced by the Architects, under the able leadership of Norm McMurrich, Architectural Club Chairman. They were divided into "modern" and "old-fashioned" phases of engineering. Along with the decorations was punch, dispensed at the Chemical Club bar, entertainment by guest performers, and novelty dances by Spike "Special Effect" Hennessey who stole the show, as he and his crew did at School Nite.

Open House hitting new records in attendance and completeness of organization was directed by Bill Gansler. Bill and his committee went all the way in making this relatively new occasion an outstanding one, and brought several new departments into the exhibitions on this Open Night.

Toike Oike, edited by Bud Brown, provided us with laughs and many good Articles throughout the year.

The 61st edition of the Transactions and Year Book, edited by Don Storey, looks as if it will be the best ever.

The Engineering Society Stores, increased to three this year with two at Ajax and the old standby in Toronto. With 3,400 students at Ajax, the voluminous sales kept Al Chapman, 2nd Vice-President of the Ajax Executive, busy most of the time. The revenue from these stores permitted the Society to sponsor many top performances this year.

Fourth year president, Rod Smith, kept us supplied with good speakers at General Meetings, and the Grad Ball, of which he was director, should be a feather in his cap, to be worn forever. Nice going Smitty.

The Athletic Association also consisted of two parts, the Ajax branch, lead by Don Bell, who gave tirelessly to his job and the Toronto association headed by our Rhodes Scholar—Keith Hendrick. Perhaps one of the biggest steps ahead this year was made by the Athletic Association, in the adoption of a new point system for the "S" award, and the introduction of a new bronze "S" for outstanding athletes. Congratulations Keith and Don, on a fine year's performance.

Rick Hill and Art Huycke must have credit heaped on them for their fine work as second Vice-President and Treasurer respectively. Jack Whitten also must receive his share of the praise, as Director of Publicity and Publications, as well as Jim Walker, our secretary who kept the Society's minutes in excellent order besides working on many committees.

The Club Chairmen worked overtime this year, having many jobs heaped upon them but all came through with flying colours.

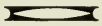
Once again I must turn my eyes toward Ajax and sincerely thank Mike McAuliffe and his executive for their co-operation and fine judgement in leading Ajax successfully through a tough year. Not only have they led Ajax, they have made the Engineering Society proud to have such a son, because that is what the Ajax Engineering Society is, a two year old son of the original Engineering Society, 61 years of age. Though Ajax cannot last forever it is at present foremost in the minds of many.

Numbers alone do not increase the size of an organization. It will not increase until its new members prove themselves worthy. So come on you Schoolmen, be real Schoolmen and never, never let School Spirit down.

May I pass on to my successor, Jim Walker, all the wealth and goodness of the Engineering Society, and may your turn as President, be as happy a one as mine. Good Luck School!

BILL DANIEL

TRANSACTIONS
1947



CONTENTS

ENGINEERING SOCIETY GENERAL MEETINGS 1946 - 1947

Chairman—C. W. Daniel *Vice-Chairman*—R. J. Smith

December 10:

The first Engineering Society General Meeting was opened with an interesting address by Mr. B. S. Shenstone of A. V. Roe Limited, Malton, Ontario. The speaker outlined the features of glider construction. The talk was illustrated with slides showing some of the more common types of gliders and their operation.

January 27:

The guest speaker for this meeting was Mr. H. A. Smith of Union Screen Plating Co., Lennoxville, Quebec. Mr. Smith outlined some of the uses of nickel and chromium plating in engineering practice. The talk was illustrated with slides and specimens.

February 10:

Mr. J. H. Parkin, Director, Mechanical Division, of the National Research Council, Ottawa, Ontario gave a general talk on the Research Council and what it has to offer the graduating engineer. Mr. Parkin showed slides of the construction and test flights of the "tail-less glider" which was built in the workshops of the Council in Ottawa.

February 11:

Mr. J. H. Parkin, spoke to a meeting of the Ajax students in the Music Room of Hart House, Ajax. The speaker outlined the work done by the National Research Council. Mr. Parkin also outlined the possibilities of summer employment with the Research Council.

February 26:

The Annual election meeting was held in the main lecture room of the Physics Building. Candidates for office during the 1947-1948 session gave forth with their best in election speeches.

February 27:

The candidates for office during the 1947-1948 session made campaign talks in the Recreation Hall at Ajax.

February 28:

Annual election day at S.P.S. A general meeting was held at the "Palace."

March 13:

Dr. Walter Clark of the Eastman Kodak Co. Ltd., Rochester, New York spoke to the final meeting for the session. The uses of photography in engineering were pointed out.

THE ENGINEER'S RESPONSIBILITY TO SOCIETY

STRICTLY SPEAKING, THIS SUBJECT IS CLOSED AS SOON AS WE have said that the engineer's responsibility is the same as everybody else's responsibility: namely, to find out what we must do if we are to go on living together on this planet. In the face of our common dismay, minor differences must disappear. Our humanity is all we have left, and our only task must be to save that humanity. Not that man is necessarily worth saving; but we are men, and we must think he is. Humble though we must be, we must allow ourselves this crumb of pride to make the work seem worthwhile.

It is true, however, that some people are better able to do this job than others, and at the top of the list I should put the engineers, and all the other natural scientists. This is not predilection or prejudice. The work itself makes the choice of workman inevitable. That work is to evaluate and direct the influences which arrange society. It is a responsible job; the word responsible always keeps appearing. History is the record of man's advance to responsibility. It is a greater burden than that of freedom; but it must be preceded by freedom, for this kind of responsibility is not the external coercion of tyranny, but the inward discipline of cooperation; and very difficult it is too.

You see, it is both a political and a religious job. Nowadays politics has become confused with electioneering, and religion with churchgoing. But politics is the knowledge of man's relations with his fellow man (obviously a job for the trained observer) and religion is the knowledge of man's relationship to God. Before I explain why that is also a job for the trained observer, I should like to point out that I use the familiar three letter abbreviation instead of an expression like the Basic Unifying Design of the Universe, even at the risk of having you think at once of an unreasonable, irascible, ill-intentioned old gentleman with long white whiskers. If occasion arises to talk about this person, we shall call him the Devil for short, and tell him to go back where he came from.

Now why are engineers involved in a religious job? The job, after all, is to find out how men may live together on the earth. The practical details will involve politics, (the science of government, not party-mongering). But first, before we decide how to

get there, we must know where we are going. We must find some reason why we should bother to live together. In other words, we must examine the world, and either find or contrive some purpose in it. I think myself the purpose is there; the trick will be to find it. Now the discovery of the Underlying Purpose of the Unifying Design of the Universe is obviously a job for the trained observer, who must take his facts down properly, and draw strict inferences from them, no matter how much either the facts or the inferences upset his prejudices, habits, or preconceived notions. You can't see the world from the bottom of a rut. So far, the job is clearly one for an engineer. That it is also a religious job is apparent when we translate the nonsense up above with capital letters into plain English, when it becomes the Will of God. You may reply that possibly God does not exist, or, if He does, He has no Will as far as we are concerned. Well, that is something we must find out; though I warn you that I am prepared to blast you by defining the Will of God as the terms on which men may live in happiness. Anybody with a turn for divinity may amuse himself by setting up this definition in theological jargon (it bears up surprisingly well). The rest of us may consider that not only our existence, but our reputation as intelligent creatures is seriously at stake unless we produce some definite results as soon as possible.

I must warn you, however, that it will be a nasty job. Besides being difficult, it will be unpopular. Nobody likes being knocked off his private set of rails, even if they are taking him over a precipice. Glimmerings of the faith that will join the nations have already appeared here and there; and they have not been well received. It is encouraging that the first signs of the wider outlook have appeared among the very men we have decided must make themselves responsible. But their efforts (perhaps a little misguided, but none the less dismayingly sincere) were described by a judge who was sentencing one of them to prison as "a loyalty transcending that to their country," an expression which the learned judge evidently feels represents the utmost extreme of opprobrium, and which represents an ignorance of the broad trend of human affairs, which is remarkable even for a judge. Notice carefully that it is not the precise details of the faith of these scientists that concerns us. It is that they should feel that there is a loyalty greater than that to their country. That is to say, they are, in this respect at least, martyrs for a new faith. My personal opinion, for what it is worth, is that Christianity, which

has not yet been tried as a practical political proposition, is the thing we are looking for. But the kind of Christianity I mean also transcends loyalty to one's country; and a good job too. It would not be worth believing in, if it were to be superseded at moments of crisis by a piece of flagwaving.

All this, as you can see, means that you are going to have a very nasty time if you do your duty. You are going to have a nasty time anyway, though, so I suggest you prepare to weather the storm with a clear conscience, and the comforting feeling that you are not entirely on your own; that you are part of a definite team trying to do a definite job, and a job which you, as a trained observer, are particularly capable of doing. As I have said, it will be unpleasant; and unpopular in certain quarters. But, if you agree with me, you will think that unpopularity in these quarters is to be regarded as a compliment. You will undoubtedly get into hot water; but while you are simmering, you can console yourselves with the thought that it is only plenty of hot water that gets off the dirt.

LISTER SINCLAIR

LIMIT GAUGING

By O. W. Ellis
Director, Dept. of Engineering and Metallurgy
Ontario Research Foundation

Gauges are used for the purpose of ensuring the interchangeability of machined parts, generally when such parts are made in large quantities. Sometimes complete interchangeability of parts is imperative, occasionally it is only desirable. In the latter case the question is whether the cost of ensuring interchangeability exceeds that of sorting parts according to their finished dimensions and mating them after they have been sorted.

If it is decided that complete interchangeability of parts is indispensable, it becomes necessary to treat each part as a unit and to provide means for checking its relevant dimensions, so as to make certain that these fall within specified limits. The magnitude of these limits will depend upon the relationship of one part to another in the assembled machine. The allowable fit of some parts may be relatively loose, that of others may be snug or even tight. Experience with the machine in service decides what the fits of parts shall be in any given assembly.

There may have been a time when all the parts for a machine were made in one shop, but now as often as not it happens that certain components of a machine are made in one shop, while other parts, the mates of these components, are made in another. Now, the dimensions of the mating parts, no matter what the source of supply, must be such that, when picked at random, they will fit as perfectly as it is humanly possible to fit them. Here is where gauges enter the picture, since it is by means of gauges that the size of the parts, wherever made, can be controlled in course of manufacture.

There are many types of gauges in use today. Of these the most important are the fixed size or limit gauge (plug or ring gauges), the profile gauge, the micrometer gauge, the limit comparator, the indicating comparator, the optical projector and its counterpart, the optical comparator, and the air gauge. There are also combination and multiple gauging devices, as well as automatic gauging machines.

Just as it is practically impossible, even with the aid of gauges, to make every part in a machine fit every other part with *exactly*

the same degree of play or interference—no two machines are identical—so it is impracticable to make two limit gauges to a definite size. For this reason the gauge maker is allowed a tolerance, small indeed compared with that allowed in the parts to be gauged, yet large enough to detect the inevitable faults of manufacture. The tolerance on a dimension is the difference between the high and low limits of size for the dimension, it is the variation *tolerated* in the size of the dimension to cover reasonable imperfections in workmanship—it admits of human error.

Not only the size, but the shape, of a machine component may be of importance in determining its value in service. To check the shapes of components such, for example, as cams, profile gauges can be employed, since to measure *all* the dimensions of such components would be obviously unreasonable. In using a profile gauge, in the manufacture of many of which considerable ingenuity and skill are displayed, its gauging edge is placed against the profile to be checked. The fit of this edge against that part of the component to be measured is generally judged by visual examination of the junction between gauge and part against an illuminated background. Even though the human element preponderates in the use of profile gauges, they generally fulfil their requirements to the satisfaction of everyone concerned in obtaining machine components which will function in accordance with design requirements.

The shape of components can, of course, be checked by projecting their shadows on a screen to which may be applied previously carefully prepared over-size drawings or tracings of those contours of the parts which require examination. The images obtained by optical means can be magnified 10, 20, 50 or even more times, though there are few instances where magnifications in excess of 50 diameters are employed. The complete examination of thread plug gauges involves a check of the form of the thread, since the angle of the thread and the shapes of the crest and the root of the thread are of vital importance in determining the behaviour of the gauge. It is of importance to note that, in the study of the form of thread plug gauges, consideration has to be taken of the fact that the thread is a helix and that, in order to obtain a true shadow of the thread, the axis of the thread has to be turned at an angle to the axis of the light beam. This angle will correspond to the helix angle of the thread, which is the angle made by the helix of the thread at the pitch diameter with a plane lying at right angles to the axis of the thread. A little thought will make it clear that the

helix angle increases as the size of the screw thread increases. The pitch diameter of a straight screw thread is equivalent to the diameter of an imaginary cylinder whose longitudinal axis corresponds to this axis of the screw and which intersects the threads at such points as make equal the widths of the threads and of the spaces between the threads. In the case of a taper screw thread an imaginary cone deputizes for the imaginary cylinder referred to in connection with the straight screw thread.

As to fixed size or limit gauges, these are of two types—GO and NOT GO. The GO and NOT GO gauges for a given dimension can be and often are incorporated in one device. Insofar as holes are concerned, the GO plug or male gauge nominally corresponds in dimensions to the *lower* limit of the hole, while the NOT GO plug or male gauge nominally corresponds in dimensions to the *upper* limit of the hole; we say "nominally" because, as was pointed out above, tolerances are allowed in all fixed size or limit *gauge* dimensions as well as in all component dimensions. In the case of shafts, the GO ring or female gauge nominally corresponds in dimensions to the *upper* limit of the shaft, while the NOT GO ring or female gauge nominally corresponds in dimensions to the *lower* limit of the shaft.

In the early days of mass production gauging systems depended mainly, if not entirely, on the use of GO gauges. This ensured complete interchangeability of machine parts, but left out of account the question of possible variations in the allowable degrees of play or interference between mating components. The limit system of gauging, which involves the use of NOT GO as well as GO gauges, brought about a reduction in the cost of high-class work, since it considerably reduced the time spent by the mechanic in producing work that fitted his GO gauges as closely as he, often acting on his own initiative, deemed desirable. Speaking generally, GO gauges should be designed so as to check as many dimensions as possible simultaneously. NOT GO gauges, however, should check but one dimension at a time. They serve only to control the degree of slackness (see definition of 'Fit' below) between mating parts to that permitted by the designer.

The vocabulary of the manufacturer and user of gauges, and from this we have already selected some terms, may offer considerable difficulty to the layman, but, no matter when the attempt is made to apply scientific methods to any art, exact definitions are essential, if confusion is to be avoided, even among the initiated.

Hence we present a few of the terms employed in this field of work.

Dimension—A dimension is a feature of any piece of work, such as a length or a diameter, of which the size is specified.

Nominal Size—The nominal size of a dimension or part is the size by which it is referred to as a matter of convenience.

Basic Size—The basic size of a dimension or part is the size in relation to which all limits of variation are assigned.

NOTE: The nominal and basic sizes of a dimension or part are often the same.

Actual Size—The actual size of a dimension or part is the measured size of that dimension.

Limits of Size (or, more briefly, limits)—The limits of size (limits) for a dimension or part are the two extreme permissible sizes for that dimension.

NOTE: The high (H) limit for a dimension is the largest size permitted for that dimension. The low (L) limit for a dimension is the smallest size permitted for that dimension.

Tolerance—The tolerance on a dimension is the difference between the high and low limits of size for that dimension; it is the variation tolerated in the size of that dimension to cover reasonable imperfections in workmanship.

Limits of Tolerance—The limits of tolerance are the differences between the two limits of size (limits) and the basic size of a dimension.

NOTE: (1) Each limit of tolerance should be associated with its appropriate sign.

(2) The difference between the limits of tolerance of a dimension is equal to the tolerance of that dimension.

Allowance—Allowance is a prescribed difference between the high limit for a shaft and the low limit for a hole in order to provide a certain class of fit.

NOTE: (1) An allowance may be either a positive or a negative amount according to the type of fit in view. A positive (or plus) allowance results in a clearance fit and a negative (or minus) allowance in an interference fit.

(2) Tolerance and allowance are two separate and distinct things.

Fit—The fit between two mating parts is the relationship existing between them with respect to the amount of play or interference which is present when they are assembled together.

NOTE: There are three principal classes of fit as follows:—

(a) "Clearance fit" where there is a positive allowance between the largest possible shaft and the smallest possible hole.

(b) "Interference fit" where there is a negative allowance (obstruction) between the largest hole and the smallest shaft, shaft being larger than the hole.

(c) "Transition fit" covering cases between (a) and (b), i.e., cases in which the limits admit of either clearance or interference fits being obtained.

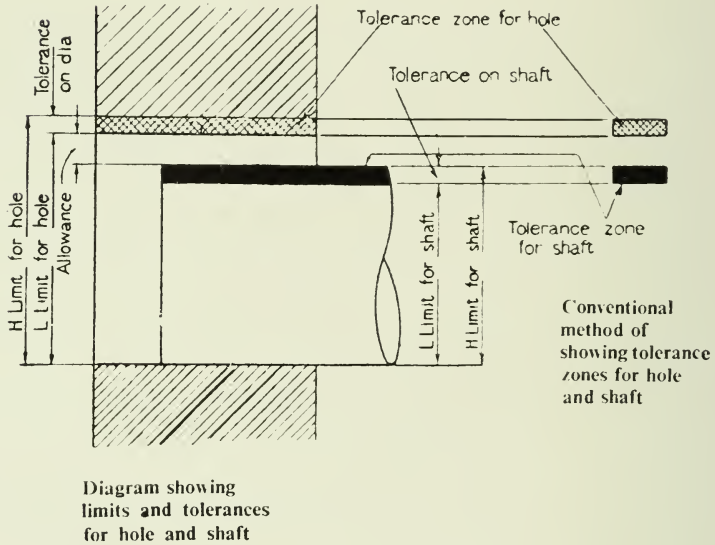


FIG. 1

The limits of size and the tolerances for a hole and its mating shaft are illustrated diagrammatically in Fig. 1 (B.S.I. British War Standard 969—1941). Here, for purposes of simplification, the shaft is shown in contact with the lower surface of the hole. The tolerances are shown at the top, those for the hole being cross-

hatched and those for the shaft being black. The tolerance bands or zones are reduced diagrammatically to an understandable form on the right of the diagram. A diagram such as this is of considerable use in showing the positions of the tolerance bands or zones of GO and NOT GO workshop and inspection gauges in relation to the tolerance bands or zones of the holes and shafts the dimensions of which they are intended to check.

Unless gauge tolerances are specified, the gauge manufacturer usually limits the gauge tolerance to 10 per cent of the work tolerance. In the United States gauge tolerances for fixed size or limit gauges have been standardized both according to nominal size and to the degree of accuracy demanded in the gauging operation, in the manner shown in Table 1 below:—

TABLE I

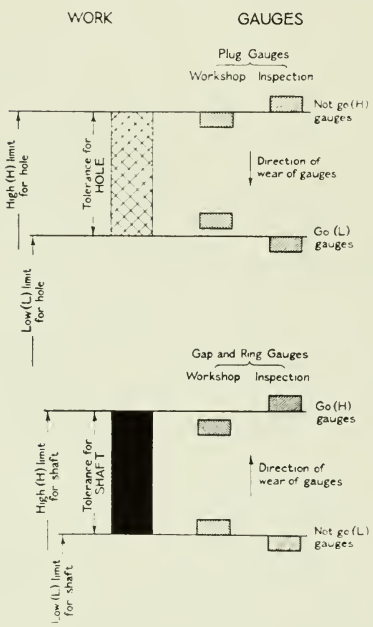
Nominal Size—Inches		*Gage Makers' Tolerances Classes*				
Above	*To and Including*	*XX (Male Gages Only)*	*X*	*Y*	*Z*	*ZZ (RingGages Only)*
.029	.825	.00002	.00004	.00007	.00010	.00020
.825	1.510	.00003	.00006	.00009	.00012	.00024
1.510	2.510	.00004	.00008	.00012	.00016	.00032
2.510	4.510	.00005	.00010	.00015	.00020	.00040
4.510	6.510	.000065	.00013	.00019	.00025	.00050
6.510	9.010	.00008	.00016	.00024	.00032	.00064
9.010	12.010	.00010	.00020	.00030	.00040	.00080

Of the gauges classified above, those in the XX group are normally employed as reference gauges or in the final inspection of components made to the closest tolerances. Continuing from the gauges in the XX group to those in the ZZ group gauge tolerances become increasingly greater and the gauges, therefore, are employed for the checking of components having progressively greater limits of tolerance.

So-called limit systems have been the subject of much argument and heated discussion. Such systems can be based on shaft dimensions or on hole dimensions. In this connection a questionnaire submitted just before World War II to various firms in Great Britain engaged in all classes of engineering work elicited the fact

that about three-quarters of those who replied were working on a hole basis. This accounts for the fact that the tables in the latest publication of the British Standards Institution on Limits and Fits for Engineering were compiled on a hole basis, i.e., the hole was made the constant member and the various fits were obtained by varying the size of the shaft.

Limit systems are referred to as unilateral and bilateral according to (a) whether the *lower* limit of the hole is taken as the basic size of the hole (or the *upper* limit of the shaft is taken as the basic size of the shaft), or (b) whether the limits of hole or shaft are arranged one above and the other below the basic size of the hole or shaft. It is around the question whether limit systems should be unilateral or bilateral that most controversy has occurred.



A growing body of opinion, however, appears to support the former system as being the more logical. The system in its most extended form involves holding both gauge tolerances and wear allowance entirely within work tolerance limits. This reduces manufacturing tolerance by the sum of the gauge tolerances and wear allowance on both GO and NOT GO gauges, but strictly maintains work tolerances, at least when the gauges are new. This is brought out clearly in Fig. 2 (B.S.I. British Standard 969—1941) which shows the relationship between the hole and shaft tolerances of the corresponding workshop and inspection gauges. The open space or margin between the tolerance zone for the GO workshop gauges and the low and high limits in the case of the hole and shaft respectively is the wear allowance. When the work tolerance permits, a similar, but smaller, margin can be introduced for the purpose of distinguishing clearly between the tolerance zones of NOT GO workshop and NOT GO inspection gauges. No wear allowance is shown in Fig. 2 for the NOT GO workshop gauges; this is because, for obvious reasons, NOT GO gauges wear less than GO gauges.

Wear allowance bears no constant relationship to work tolerance, since gauge wear varies according (1) to the type of material undergoing inspection; (2) to the type of material of which the gauge is made and (3) to the nature of the gauging operation—some gauges suffer more abuse than others; workshop gauges for example, wear more rapidly than inspection gauges.

Experience alone can decide what wear should be allowed in a gauge of given design and material before it is removed from service. However, once experience has shown what allowance should be made for wear in a particular gauge that allowance should be specified and the gauge should be rectified, scrapped or put into service as an inspection gauge (see second paragraph below) as soon as the allowance for wear has been exhausted. Much fruitless argument between production and inspection may be avoided by adhering to this practice.

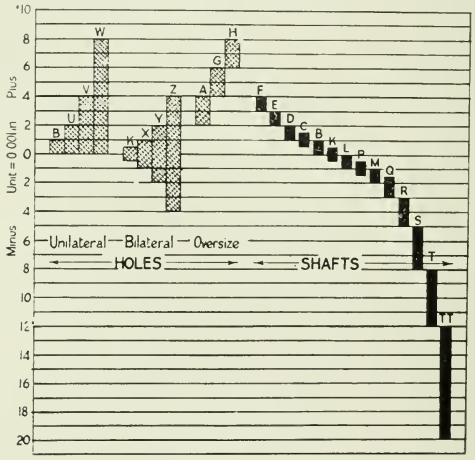
Here it may well be emphasized that inspection gauges should have no place whatsoever in the machine shop or the works inspection shop. They should be employed only by the purchaser, his representative or an equivalent party who, generally speaking, will be under contract to accept the work whose dimensions fall within the limits which have been specified by him. Works inspection should invariably be carried out with suitably designed workshop gauges.

Where circumstances are such that large numbers of workshop gauges are available it may be worth while to divide these into two groups, one for use in setting up machines etc. and the other for work inspection alone. This may be done by measuring the gauges when new and employing those closest to the work limits for work inspection. When the GO gauge used in the machines become slightly worn, but are still otherwise in good condition, they may be employed for work inspection. Here they may continue in service until they become worn to the low work limit for holes or the high work limit for shafts, as the case may be. When the wear on GO workshop gauges renders them no longer serviceable even for works inspection they may yet be found suitable for use as inspection gauges (cf. Fig. 2); thus, while inspection gauges should never be found in the shop, workshop gauges may ultimately find their way into inspection.

Gauge tolerances increase with work tolerances—remember the rough and ready 10% rule! However, these tolerances do not depend directly on the size of the gauges or the size of the work;

they are made as large as practicable to facilitate the manufacture of the gauges. A class XX gauge (see Table above), which is one of the highest accuracy practicable for cylindrical plug gauges, will cost more to make than a class X gauge and considerably more than a class Z gauge. It should be borne in mind that excessive gauge tolerances involve unjustifiable reductions in work tolerances and increase the chance of work being accepted whose dimensions are outside the specified limits. This is particularly true of inspection gauges. It would be well for designers to bear this point in mind and to choose work tolerances as large as possible consistent with the proper proportioning of parts. As is pointed out in War Emergency British Standard 969—1941, "In deciding upon the tolerances for two mating parts too much attention is often paid to the conditions which would result from the assembly of work pieces made to the loosest and tightest possible fits. Such extremes of fit are very unlikely to occur in actual practice and a much better choice of tolerances is obtained by considering the *average* condition of fit." Insofar as fit is concerned, a variety of terms is employed —wrench fit; close fit; medium fit; free fit and loose fit in American practice and the terms referred to in Table 2 in British practice. The influences of fit in determining tolerance zones is made clear in Fig. 3 (B.S.I. British Standard 164—1924) which, as an example, shows diagrammatically the tolerance zones for both 4-inch British Standard Holes and 4-inch British Standard Shafts of varying fits.

DIAGRAM ILLUSTRATING TOLERANCE ZONES
FOR 4 IN. STANDARD HOLES AND SHAFTS



Dealing first with holes, the tolerances commonly used for good quality holes are those denoted by U and X in fig. 3. The closer tolerances (B and K) are only employed in work of a very precise nature.

As to the shaft tolerances, these remain unchanged as the fit varies from what is referred to as "heavy drive" (F in the diagram) and what is designated "close running" (M in the diagram). Tolerances Q to TT and the corresponding allowances are increased to allow for increased clearances and lower grades of workmanship. The terms that are applied to the other classes of fit shown in this diagram in relation to U (unilateral) and X (bilateral) holes, as the case may be, are shown in Table 2.

TABLE 2

Designation	*U Holes*		*Designation*	*X Holes*	
F	Heavy Drive	Interference	F	Force	Interference
	Light Drive		E	Heavy Drive	
			D	Light Drive	
D	Heavy Keying	Transition	C	Extra Light Drive	Transition
C	Medium Keying		B	HeavyKeying	
B	Light Keying		K	Medium Keying	
K	Push		L	Light Keying	
			P	Push	
L	Slide or Easy Push	Z	M	Slide or Easy Push	Z
P	Easy Slide or Close Running		Q	Easy Slide or Close Running	
M	Close Running (1)		R	Normal Running	
Q	Close Running (2)		S	Slack Running	
R	Normal Running		T	Extra Slack Running	
S	Slack Running		TT	Coarse Clearance	
T	Extra Slack Running				
TT	Coarse Clearance				

Z = *Clearance*

ADHESION

THIS IS IN NO SENSE A DOCUMENTED SCIENTIFIC PAPER, BUT A discussion in rather free style of the problems involved in adhesion and, specifically, adhesion when applied to wood structures.

During the past hundred years, it has cost us a great deal to be ignorant about viscosity; so as a result, much time and money have been spent on research into viscosity and its various effects. The reason, of course, is that friction, in this mechanical civilization, is expensive and lubricants essential, lubrication and viscosity being different manifestations of the same thing: shear in fluids.

A property rather similar to viscosity is surface tension. It has never been obvious, however, that our ignorance of it cost us very much money, with the result that the surface phenomena in solid and liquid materials are still in a region beset with question and doubt.

Ordinarily, matter is divided into three phases of solid, liquid and vapor or gas, but I tend to feel that there is a fourth phase—the surface phase, because it may be observed that the molecular force patterns in the three original phases are reasonably uniform in their spatial distributions, but in the surface phase, there is a high force gradient normal to the surface—a state of affairs different indeed to that within the body of a solid or a liquid or a vapour. This high spatial force gradient gives rise to peculiar effects. For example, it will orient the direction of some molecules, these orienting forces being due to assymetric residual field forces in the molecules. The forces are electrical in nature, and are called Van der Waals forces, Valence forces etc.

The mechanism of adhesion is inextricably bound up with the mechanisms of surface tension. Debye's work on polar molecules was a part of the beginning of the modern theories of specific adhesion. Previously, adhesion was thought to consist of a mechanical inter-locking of the adhesive and the adherend, about the same kind of thing as a mass of lead poured into a ball of greasy steel wool. It is very difficult to pull the lead out of the steel wool, but it is still not stuck to it because the greasy steel does not tin, as the tinsmith says.

The specific adhesion attitude is founded on the residual surface forces set up by the molecules that happen to be in the surface. These forces are called "polar forces," and are, by their nature,

electrical. They are the ones mentioned above. The effect of these surface forces can be demonstrated by observing the way in which clean water will wet a really clean piece of glass compared to the way it behaves when the glass is slightly greasy. An up-curving meniscus indicates wetting—down curving, repulsion.

Adhesives, generally and historically, start with the animal glues. It was probably found out, as soon as anyone had a cooking pot that if one boiled bones long enough to produce a jelly, if the jelly were allowed to sit around for a long time, it hardened into a material rather like horn. After, some bright ancestor of ours remembered that it had been a liquid, and tried putting it on two pieces of material, as a liquid, in the hope that it would turn into the solid form later, and discovered, probably to his joy and, we hope, his profit, that it did. These animal glues made from hide and hoofs are still the best glues that we have when it comes to pure strength.

After glues made from the animal's body, we proceed to glues made from animal products, such as milk casein and blood proteins. The Chinese have used a form of casein glue and albumen glue for many centuries, but it is only lately that the casein glues have come to the fore as industrial materials for assemblies. These modern casein glues were really developed during the War of 1914-1918 to assist in the rather crude early efforts to build wood aircraft because the resistance of casein glues to water is very much higher than that of the ordinary animal glues.

It was found, shortly after the production of celluloid commenced, around the turn of the century or a little earlier, that a solution of celluloid, or cellulose nitrated just short of the guncotton condition, in certain solvents, made an excellent adhesive for some purposes. These solutions are still used very largely in the form of cements for the construction of model aircraft and for the assembly of many leather and cloth articles.

We next come, historically, to the polymerization of the synthetic resins, and it was found that many of these resins, due to their ability to change from a liquid to a solid condition, made good adhesives. We then find the whole field of the modern, so called, plastic glues, made from urea formaldehyde resins, the phenol formaldehydes, followed by a family of other types of resin, such as melamine and resorcinol resins, all resistant to water, in some cases, boilable without causing the laminate to come apart. Some of these glues work in the cold, with the presence of

chemical catalysts to accelerate polymerization or set up. Others must be warmed up, in which case the high temperature completes the polymerization and sets the glue.

The gap filling characteristic of the animal glues, that is, their ability to fill a slight space between the two pieces of material being joined, was difficult to procure in the synthetic resins, especially the urea formaldehyde group. This meant that for good joints in urea formaldehyde assemblies, the finish and surface of the two pieces had to match each other exactly, and be in full contact throughout their area. Some of the present urea glues are capable of filling gaps up to several thousandths of an inch, which has very much improved this particular characteristic. The phenols did not give this trouble to such a severe degree, but they gave others—one, that they soaked into the wood and disappeared.

Another characteristic of most of the synthetic glues is that they are brittle, and do not match the elastic characteristics of wood.

The last group of adhesives which have appeared are peculiar mixtures or co-polymers, of the synthetic rubbers and other synthetic resins. These are the adhesives that appeared late in the last war for fastening metal assemblies to wood. Most of them required heat to develop full strength, and they will allow joints to be made stronger than the wood itself. They are so highly polar that they stick to the wood with incredible tenacity, but at the same time, their non-polar nature causes them to stick to the metal. They are so elastic that material spilled on the hands of the worker remains there for many days before it wears off, because it stretches to about the same amount as skin, and sticks to skin with the same tenacity as to wood.

It may be seen from the above that the field of adhesives available is wide, and conversation with salesmen of the various companies making them leads one to the impression that it is even wider.

One of the characteristics of nearly all adhesives is their brittleness when set, and it should be understood that to make a satisfactory joint, stress flow through the joint should be continuous. This involves the fact that the moduli of elasticity, both in tension and shear in all directions, should be the same in the adhesive as in the adherend. This is a condition very difficult to obtain. The elastic characteristics of most glues are not the same as wood,

with the result that when the wood is heavily stressed, discontinuities of stress occur at the glue lines.

Wood, for example, is an unhomogeneous, anisotropic material. It has three moduli of elasticity in tension, three different ones in compression, and three in shear. It has six Poisson's ratios, and as many ultimate strengths as it has elastic moduli. Further, it changes dimensions with moisture content.

Under these circumstances, it seems almost impossible that anybody should ever be able to make anything permanent out of wood. However, these characteristics do not become obtrusive until the material is used for a complex structure subjected to high stress, such as aircraft, small high speed boats, or automotive components. The way in which these properties become obtrusive is that the rates of expansion and contraction with moisture content are very different, tangentially, radially and longitudinally, with the result that when wood is laminated up into three ply or more, the presence of water produces large shear stresses that will eventually de-laminate the board, even though the glue be stronger than the wood. It is the same kind of business as the loosening of the handle in the hammer head.

Another characteristic of glues is that they have high strength in shear and give good strength when subjected to shear, but their strength in tension is usually low. The result has been, over the centuries of the past, that normal cabinetmaking and other wood assembly procedures with glue have produced joints in which the glue line is stressed very largely in shear and very little in tension. The mortise and tenon joint and dowels are examples of this.

The handling of adhesives in the shop presents, sometimes, small technical problems. For example, the pot life of a glue is the time from mixing until the glue becomes useless. This varies with the material, and it also varies with the temperature of the room. A pot life of half a day, or four hours, is about the minimum which is usable industrially. With some adhesives, this can be obtained by keeping the pot in cold water, but in others it can be obtained by merely keeping it at a room temperature below 70 degrees Fahrenheit. Coloured dishes are usually used to designate the morning and afternoon mixes.

Mixing procedures vary, but the most usual and simplest one involves a mixer rather like a small drill press with a paddle instead of a drill, and a motor to drive it at low speed. The glue is placed

in a crock or enamelware vessel, and mixed until a satisfactory texture is obtained.

Delivery of glue to the work people can take place in small metal containers, the washing of which is a nuisance, or in some cases, in paper containers which are thrown away. Alkaline casein glues are bad for paper.

The disposal of unused glue, of which there should not be more than 5 to 7 percent, presents somewhat of a difficulty sometimes, because, being insoluble when set, it is unpleasant material to put into the sewers.

The application of glue is done either by brushes or spreaders. Nylon brushes are usually recommended for this purpose, as the alkaline casein glues and the acid cold setting synthetic glues all tend to attack normal bristle materials. Hand glue spreaders consist of small wood paddles with notches filed in the working edge. The glue is applied to the material and spread so that the amount running through the notches gives a satisfactory weight of glue per unit area of the work.

In clamping the material up, the pressure should be sufficient to close the joint and perhaps a little more, but contact is usually sufficient. These pressures are lower than many people think, with thin laminated structures. However, with a large piece of timber, it becomes necessary to apply large pressures to deform the high spots sufficiently to close the glue line in the low spots. This is done by many kinds of ingenious tricks. One of the best is to use fire hose filled with compressed air and a steel clamp. The compressed air is turned on, clamping the whole assembly under uniform fluid pressure. Other techniques, of course, involve screw clamps, wedges, hydraulic clamps, and all the other methods of applying pressure. The time in the clamps varies, of course, with the adhesive being used, from a few minutes to twenty-four hours, and in some cases, heat must be applied with the pressure.

A characteristic of glued wood production to be watched is the effect of the set glue on the woodworking machine tools, as some of the glues have a very bad effect on sharp cutters and the use of one glue may increase sharpening expense to a marked degree, especially in removing squeeze-out and other large quantities of glue that may be found on the edges of thick laminates.

Adhesion will be used more in the future, for making cheaper, more efficient, assemblies. Structural arches, furniture, automotive and aircraft components, and marine applications are all included

in the field. Toys, sporting goods and novelties are a very important business, and the new adhesives are already changing designs, prices and profits, for the better.

MORLEY LAZIER

ATOMIC ENERGY - AND THE ENGINEER

I.

THE TECHNIQUE OF OUR CENTURY GREW OUT OF THE SCIENTIST'S dreams; though this technique shaped and changed our external world, its foundations lie in the simple experiments of Galileo and Faraday, in the speculations of Maxwell, in the imagination of misunderstood dreamers like Robert Julius Mayer, in the theoretical work of Clausius, Planck, and Einstein.

No chapter in the history of human thought shows more clearly the connection between theory and technique than that of atomic energy. One thinks wrongly that the atomic age was born when the first atomic pile began to operate, or perhaps when the first man-made atomic bomb exploded on the New Mexico desert. Yet both events happened only because for fifty years scientists all over our globe experimented and speculated on the structure of the atom. They did so because they were curious, because they wanted to understand the phenomena of nature; they did not do it for the sake of producing an atomic bomb.

Mass *is* energy, mass can change into a form of energy that some day we shall be able to utilise technically! This conviction grew from Relativity Theory, seemingly the most abstract and, technically, the most useless branch of Science!

The equivalence relation between mass and energy is $E = mc^2$ where E is the energy in ergs, m the mass in grams, and c the velocity of light in cm sec.$^{-1}$. Thus one gram if converted entirely into energy is equivalent to 9×10^{20} ergs!

Through quantum-theory we try to describe the laws governing the structure of atoms. It was only in this century that we understood how all our material world is composed of *elementary* particles of the same kind; just as houses in a town, of different size and architecture, may be composed of the same kind of bricks. We shall enumerate here the three most important bricks of matter.

1. The *electrons*. These are light negatively charged particles. In the most often repeated comparison, their role in atoms is likened to the planets revolving around the sun—the nucleus.

2. The *protons*. These are heavy particles, positively charged, the bricks of which the sun-nucleus is made. A proton is around two thousand times heavier than an electron.

3. The *neutrons*. These are uncharged elementary particles; the bricks of which the sun-nucleus is made. The mass of the neutron is approximately equal to the mass of the proton.

Thus each of the 92 elements of which our material world is composed is characterised by *two* integers telling us how many protons and how many neutrons are in the nucleus. (The number of electron-planets in the electrically neutral atom is equal to that of protons).

Every atom can be characterised by the symbol A_{Np}^{Np+Nn} where A is the chemical sign for the element, Np the number of protons in the nucleus, and Nn the number of neutrons. Thus the hydrogen, the lightest among the elements can be represented by the symbol H_1^1. It tells us that *one* proton is the nucleus of the hydrogen. H_1^2 is the *heavy* hydrogen or deuteron. Its nucleus consists of one proton and one neutron. He_2^4 is helium, the nucleus of which is composed of two protons and two neutrons. U_{92}^{235}, the last element has a nucleus composed of 92 protons and 143 neutrons, whereas U_{92}^{238} has a nucleus composed of 92 protons and 146 neutrons.

Hydrogen or Uranium, or practically any element has its *isotopes*. What do we understand by the word *isotopes?* If two nuclei have the same number of protons but different numbers of neutrons we say that they are isotopes of the same element. Thus the so-called Uranium 235, Uranium 238, Uranium 239 are isotopes, because their atoms have the same number of protons (92) but different numbers of neutrons. In nature we usually find the isotopes mixed up. Common lead, is, for example, a mixture of many isotopes, and it was a very difficult task theoretically to devise methods of separating such isotopes, and a very difficult experimental task to achieve such a separation technically on a large scale.

It took the scientists years of incessant effort to understand the simple facts that we have summarised here briefly. They were gained by the collaboration of physicists all over the world. We learned to understand the structure of the atom because of the work of Niels Bohr in Denmark, Lord Rutherford in England, Madame Curie in France, Fermi in Italy, Lawrence in the U.S.A., and because of the work of hundreds of others on all parts of our globe.

Once we had successfully formulated the basic facts concerning the architecture of the atom and its nucleus we could ask and we did ask new and fundamental questions. Can we reject a neutron from an atom or inject a neutron into an atom, thus changing in

this way one isotope of an element into another isotope of the same element? Can we inject one (or two) protons into a nucleus or reject one (or two) protons from a nucleus, thus changing one element into another?

Thus in our second question we are faced with a problem as old as the vague and confused dreams of the alchemists; to change one element into another. Indeed by bombarding the nuclei of one element either with elementary particles or with nuclei of light elements, we can both change one isotope into another and one element into another. Thus a new nuclear chemistry was born.

The results of these bombardments can be written in the form of an equation. For example:

$$He_2^4 + N_7^{14} \longrightarrow O_8^{17} + H_1^1.$$

This means: A helium nucleus striking a nitrogen nucleus produces an oxygen nucleus and a proton (or hydrogen nucleus). Or:

$$Li_3^7 + H_1^1 \longrightarrow He_2^4 + He_2^4.$$

(The sum of the subscripts on the left and right side must be the same always because the number of particles and the charge must be preserved.)

Yet ten years ago the chances of technical utilisation of this accumulated knowledge of nuclear chemistry seemed extremely small.

We know that mass is a tremendous store of energy. We know also, from experiments, that transmutation of one element into another or one isotope into another may free part of this tremendous store of energy. Could we then, by transmuting one element into another, change a part of mass into energy and use it to run our factories thus dispensing with coal and oil?

The outlook for utilisation of this atomic energy was not very hopeful until 1939. Yes, we could gain some energy, but to gain it we had to expend more than we gained. We were, so to speak, in the position of a general who sacrifices a hundred men to liberate one prisoner. But the situation changed when in January 1939, Hahn and Strassmann's paper appeared in Germany. It contained the first indication of what is called *fission:* sudden and spontaneous release of the imprisoned atomic energy in such an amount as to make it the most powerful weapon both for construction and destruction.

The first phenomenon of fission was discovered in the case of Uranium 235. An atom of such a Uranium splits into medium

weight atoms, throws out a few neutrons and releases amounts of energy unknown in any previous transmutation. What will happen, if these flying out neutrons split another atom, and release other neutrons which will split other atoms? In other words, what will happen if we have Uranium 235 in which a chain reaction once started disintegrates all the atoms and in a sudden outburst releases a part of its imprisoned energy? The answer is: we shall have an atomic bomb. One pound of Uranium 235 will yield the energy of 1,400 tons of coal!

Thus to manufacture any atomic bomb means to manufacture Uranium 235 in such a considerable quantity, that once a neutron splits an atom, the chain reaction will not die out, that new neutrons will be born to replace those that escape until the whole mass is engulfed in this sudden transformation. To achieve this the mass of Uranium 235 must be sufficiently great.

From the physical and technical point of view the chief problem was to separate Uranium 235 from the common Uranium 238. One atom of Uranium in every 140 is slightly lighter than the rest. The difficult task was to separate Uranium 235 from its other isotopes; then to learn how to combine quickly two undersized, harmless parts, creating (by shooting one part into another) *one* oversized part that must explode because it is oversized.

An alternative way of creating an atomic bomb is to form quickly an oversized mass not of Uranium 235, but of Plutonium. Whereas Uranium 235 exists and has only to be separated from the much more common Uranium 238, Plutonium was not known to exist; it had to be manufactured artificially by *piles*, that is by piling up in the proper shape and order, blocks of pure Uranium and of, say, graphite, which in this pile arrangement is called a *moderator*. From the lightest element Hydrogen to the heaviest element Uranium, nature provides us with a chain of 92 elements out of which all matter is formed. But the human mind and the work of man can prolong this chain by two links. Neptunium and Plutonium form these links, and it is the last link, Plutonium, that has similar explosive properties to Uranium 235.

In terms of our present knowledge the formula of nuclear chemistry leading to the manufacture of Plutonium is:

$$U_{92}^{238} + N_{0}^{1} \longrightarrow U_{92}^{239} \longrightarrow Np_{93}^{239} + e_{-1}^{0}$$

$$Np_{93}^{239} \longrightarrow P_{94}^{239} + e_{-1}^{0}$$

In words: Uranium 238 bombarded by neutrons changes into Uranium 239; this emits an electron, changing into Neptunium. This emits another electron changing into Plutonium.

The importance of the *pile*-discovery lies in the fact that here the chain reaction is not *explosive* but *controlled.* It is this pile arrangement that promises to become an important controlled source of atomic energy for its technological use. The commercial piles of the future will "burn" Uranium 235. Splitting into fission fragments, its atoms become a source of neutrons. These in turn bombarding Uranium 238 change it into Plutonium. It seems possible—through this reaction—to get from the pile far more heat than the equivalent of 1,400 tons of coal for each pound of Uranium 235 split. The possibilities of technical application are immense.

Part II

The atomic era would have started, war or no war. Yet, undoubtedly war tremendously accelerated the advent of the atomic age. Who would have furnished two billion dollars for atomic development in peace time? Yet war not only accelerated the coming of the atomic era. It deformed the natural development, it emphisized death and destruction instead of productive building and creation of new powerful sources of energy. It deformed hopes into fears, scientific collaboration into mistrust, the achievement of scientists into a plaything of politicians.

Yet if we may hope that the world will live in peace, we may hope too that the development of atomic energy will shift quickly into the engineering phase of building and managing sources of energy. In the coming fifty years there should be a need for atomic engineers as great as that for electrical and mechanical engineers in the past fifty years. It is difficult and risky to predict the future. But if the history of science and technology has taught us anything then it has taught us that progress is more rapid, more radical than the vision of man.

Thus, I believe, we can safely predict an ever expanding atomic industry. As this atomic industry develops, the atomic source of power may become much cheaper than coal and oil. The first step would be to use piles as the source of heat that could in great industrial establishments be converted into, say, electric current. But, of course this would be only the beginning. The possibilities for the use of atomic power seem limitless.

What has been said leads to an obvious conclusion. The knowledge of atomic theories, of atomic experimental methods will be for the future engineer as important as the knowledge of Ohm's law or the laws of statics ever was for the engineer of yesterday. Yet what have the polytechnical schools done to adjust themselves to this entirely changed situation? They have done nothing.

If the war has taught us anything, then it should have taught us that, more than man power, the level of scientific and technical research is the indicator of the strength of a nation. It should have taught us that a high research level is even more important than a high engineering level. The engineering achievements of a nation follow only—at some distance—its scientific achievements. To-day we have in our hands all the scientific means of changing the life on our planet, and of freeing man from the curse of earning his daily bread through pain and sweat. Yet the engineering achievement which could turn the vision of a world of plenty into reality lags far behind all the possibilities opened by science. The scientists' discoveries are not utilised at all, or they are utilised only for the benefit of a few. There are, and there will be, for a long time, forces trying to hinder progress. These forces will try to retard the utilisation of atomic energy. Imagine that to-morrow, atomic energy turns out to be ten times cheaper than coal or oil. Would not all those who have coal mines and oil wells fight the utilisation of atomic energy with all their might?

Yet, in spite of all this, I do believe that utilisation of atomic energy must come and will come. This must be so because a country that does not utilise atomic energy would soon become like a country that yesterday did not utilise electric power; it would become backward and weak, a prey to its more powerful neighbours. Thus atomic energy must and will come into the life of our nation.

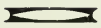
It seems, from the point of view of the universities, from the point of view of the nation, that our physical institutes, our engineering schools, should adjust themselves quickly to the changing times. The problem is especially important for Canada. *We* are a part of a continent where the first atomic bombs were made. *We* provided the raw material. Let us hope that in the future *we* shall not send out uranium to manufacture bombs, but will ourselves manufature, not bombs, but piles and other sources of energy.

We may then ask: how are our universities prepared for the invasion of atomic power? To give one example: The greatest university in this country, a university that has many chairs for Greek, for Semitic languages, for Fine Art, has not one man, I repeat, no one man, whose special work is nuclear physics! Yet, in spite of this fantastic state of affairs, the university can hardly be blamed for it. Nuclear physics is not a subject that can be taught freely. Nuclear physicists are snatched by the Government, bribed by rich facilities of research put at their disposal, and persuaded to work in seclusion and secrecy. They are the high priests of secret learning in modern monasteries of piles, heavy water, and Geiger counters. But the scientists of to-day show growing signs of discontent; many of them fight courageously against secrecy and for scientific collaboration. Let us hope that they will succeed in making science free again. If they do, the universities will become centres of nuclear research, in which young people may be educated for the coming age of atomic technology.

LEOPOLD INFELD

YEAR BOOK
1947

EXECUTIVES, CLUBS,
SOCIAL FUNCTIONS



ENGINEERING SOCIETY
THE UNIVERSITY OF TORONTO

EXECUTIVE OF THE ENGINEERING SOCIETY

Top Row: L. To R.: J. A. Brown; C. W. Daniel; R. S. Hill; J. R. A. Walker.

2nd Row: F. A. Huycke; J. A. Whitten; R. J. Smith; W. A. MacDonald.

3rd Row: K. C. Hendrick; R. A. Weir; C. W. Eggert; W. G. Gansler.

5th Row: R. A. Tothe; E. L. Davies; J. M. Milson; C. A. Fry.

ENGINEERING SOCIETY EXECUTIVE

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1st Vice-President	J. A. Brown
2nd Vice-President	R. S. Hill
Secretary	J. R. A. Walker
Treasurer	F. A. Huycke

ATHLETIC ASSOCIATION EXECUTIVE

President	K. C. Hendrick
Vice-President	W. J. McCann
Secretary-treasurer	J. A. Swan

EXECUTIVE 4T7

President	R. J. Smith
Vice-President	H. J. Hamm
Secretary-Treasurer	D. H. Henshaw
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EXECUTIVE 4T8

President	W. A. MacDonald
Vice-President	R. Grass
Secretary-Treasurer	G. R. Muddiman
Athletic Rep	W. H. Nord

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Civil	R. A. Weir
Mining & Metallurgical	C. W. Eggert
Mechanical	W. G. Gansler
Architectural	N. H. McMurrich
Engineering Physics	W. R. J. Brown
Industrial Chemical	M. E. J. O'Loughlin
Electrical	D. J. T. Glenn
Aeronautical	E. L. Davies
Engineering & Bus	J. M. Milsom
Ceramics	R. A. Tothe
Debates	C. A. Fry

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Director of Publicity and Publications	J. Whitten

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President	H. W. Blakely
Vice-President	J. R. Gregory
Secretary-Treasurer	D. Kelly
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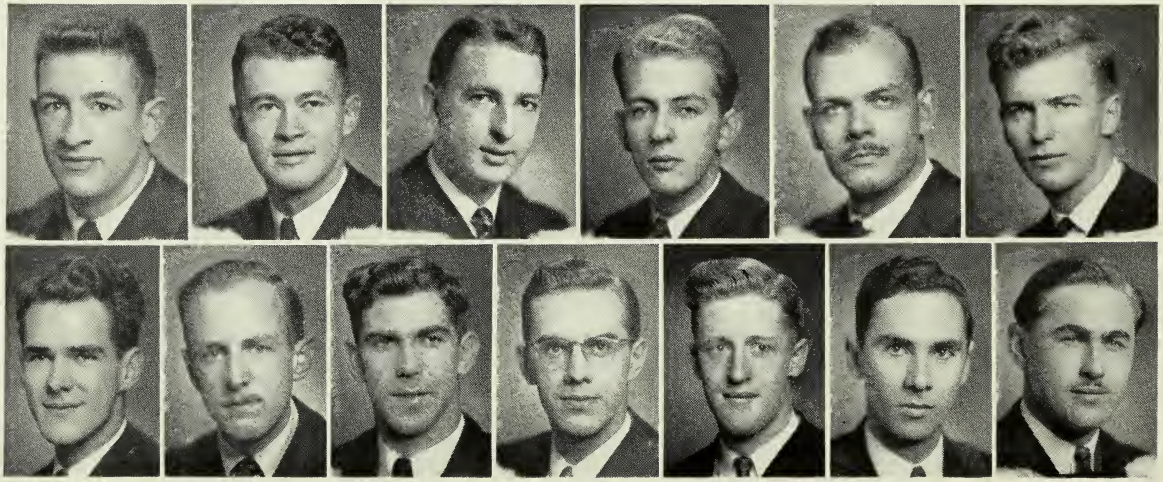
EXECUTIVE 4T9

President	E. N. Banks
Vice-President	R. C. Black
Secretary	D. W. Gardner
Treasurer	T. A. Harwood
Athletic Reps	W. D. Lawrence R. G. Hall



PERMANENT EXECUTIVE 1947

Top Row: L. To R.: T. L. Hennessy; M. E. J. O'Loughlin; W. G. Gansler; C. A. Fry; G. R. K. Lye; S. W. Forstrom.
2nd Row: N. R. Thomas; N. H. McMurrich; H. J. Hamm; D. J. T. Glenn; J. D. Baker; B. Heaslip; R. A. Tothe.

PERMANENT EXECUTIVE 4T7

President	W. G. Gansler
Vice-Presidents (2)	M. E. J. O'Loughlin
	C. A. Fry
Secretary-Treasurer	T. L. Hennessy
Councillors: Civil	G. R. K. Lye
M & M	N. R. Thomas
Mechanical	S. W. Forstrom
Architectural	N. H. McMurrich
Industrial Chemical	H. J. Hamm
Electrical	D. J. T. Glenn
Engineering Physics	J. D. Baker
Aeronautical	B. Heaslip
Ceramics	R. A. Tothe

THE EMPHASIS DURING THE LATTER PART OF OUR ACADEMIC career, has been laid on the wealth of experience and knowledge to be gained beyond the confines of the University. This knowledge is an asset, only when it can be shared with others for the advancement of society and the profession. These are common views, but the implication is that a co-operative effort is needed to attain the knowledge to be found.

That is where we come in. The graduating class of this year can accomplish a great deal by solidarity and extension of the friendships made at School.

To these ends, the Permanent Executive exists as the elected body to act as liaison between the Alumni Federation of the University and the Engineering Alumni Association, to gain the greatest possible benefits from the experience of others, and at the same time to assist in formulating policies and ideals which will strengthen a growing profession.

The officers of the Executive will be a public relations force as well as the organizing body for Class reunions and other social functions. When the time comes, give your fullest support to your Permanent Executive.

On behalf of the Class of 4T7 the Executive wishes to thank the members of the Faculty staff for their efforts on our behalf in the years we have spent here. It may be said that on no occasion have we as a class received anything but the fullest support from the staff, the Faculty Councillors, Dean Young, and the Late Dean Mitchell.

We hope that this class will justify the sincere and unstinting attention granted them and that the Class of 4T7 will bring honour and fame to the Little Red School House.

W. G. GANSLER

CIVIL CLUB EXECUTIVE

Seated: R. A. Weir; W. D. McMurtry; J. F. Walker.
Standing: E. M. Taylor; V. A. Harrison; K. W. Short.

CIVIL CLUB

ALREADY THE END OF ANOTHER TERM IS IN SIGHT, AND WITH IT comes the realization that many of our good intentions must be shelved, to await the pleasure of next year's executive.

The loss of our first and second year has been a hard blow to clubs activity, as their presence has, in the past, contributed greatly to the success of our functions. The third and fourth year found that they were too busy to back the club before Christmas, and as this is written, we find ourselves hurriedly trying to make a success of our last few months.

Our first meeting consisted of dinner in the Great Hall, followed by a smoker in the Debates Room. Professor Legget, assisted by Professor Morrison, explained the purpose and merit of the Engineering Institute of Canada, and the Association of Professional Engineers, and the boys enjoyed the vigorous discussion which developed. Later Mr. H. K. Hillier of the H.E.P.C. showed a sound movie in colour entitled "The Romance of a River," which was of great interest.

In the immediate future, our executive hopes to have that dynamic Economist Professor Morgan, as guest speaker and Colonel T. M. Medland, Director of Public Relations of the Association of Professional Engineers, whom we believe has a vast store of interesting material in connection with his trips for the association.

Arrangements for the Annual Photographic Salon are under way, and a committee is being formed under Mr. Ralph Hansen. The Judges are to be Dean Young, Professor Legget, Dr. Jackson and Dr. Jones. Entries will be welcomed from Ajax this year and we hope to exhibit the prints there. As usual, the Salon will be opened with a banquet at which the judges will announce their decisions and present the awards.

Your executive have done many "Joe" jobs behind the scenes, and the credit goes to them for club activities. They, in turn, wish to thank you for your support, without which the club cannot function.

R. A. WEIR

M & M CLUB EXECUTIVE

L. to R.: Back: C. A. Fry; B. W. Gilbert; N. G. Eley; P. Tymochko.
Front: F. Godfrey; C. W. Eggert.

MINING AND METALLURGICAL CLUB

DURING THE PAST ACADEMIC YEAR THE MINING AND METALlurgical Club executive has sponsored a number of meetings with the dual purpose of maintaining a contact with the Ajax branch of the association and of obtaining a wider knowledge of the various professional organizations connected with the Mining and Metallurgical business.

The first dinner meeting of the year was held at Hart House on November 27th, 1947. Dr. Lord, president of the Association of Professional Engineers outlined the position of that organization with regard to Mining and Metallurgical engineers. The talk was followed by a lively discussion period.

The second meeting of the year was also held at Hart House on January 17th, 1947. Mr. R. J. Ennis, Vice-President and General Manager of McIntyre Mines gave a talk on the background and nature of the Canadian Institute of Mining and Metallurgy. His vivid account of the early history of the McIntyre Mine was well received. This was a joint meeting with the Ajax branch of the Club and was well attended. Mr. C. Fry, moved and T. Hodgson, seconded a vote of thanks to the speaker.

The annual fire and brimstone ball was held in the sump at the Rideau Hotel. This meeting was well attended.

The Toronto Branch of the C.I.M.M. extended their annual invitation to the club for a joint meeting and Mr. C. Huston gave a very interesting talk on South America.

The Metallurgical Branch of the Club made one field trip to the Atlas Steel Co. at Welland, Ontario, and the entire club made the annual trip to Fahrally Limited and E. Long Ltd. at Orillia, Ontario.

The passing of Professor Newcombe of the Department of Metallurgy has meant the loss of a very good friend and professor to the students.

I should like to take this opportunity to thank the members of the executive for their excellent co-operation during the past year. I should also like to congratulate Mr. Ted Hodgson and the executive at Ajax for the excellent manner in which the affairs of the Ajax Branch were conducted.

CARL W. EGGERT

MECHANICAL CLUB EXECUTIVE

L. to R. J. Howard; Professor E. A. Allcut; W. G. Gansler; F. Jones; Dr. Otto Holden; S. W. Forstrom; B. W. French.

MECHANICAL CLUB

THIS YEAR'S ACTIVITIES WERE HIGHLIGHTED BY CLOSE CO-operation between the Student Branch of the A.S.M.E. and the Mechanical Club. Each organization made arrangements for meetings on alternate occasions and the happy result was interesting well attended meetings.

This year's activities were opened on November 21st, as a splendid film and lecture were given by Mr. Turkin of the Goodyear Rubber Co. Ltd. Hart House was the scene of all regular meetings, dinner in the Great Hall preceding each business session. The Canadian National Carbon Co. Ltd represented by Messrs. Thompson and Dewar presented a fascinating film on their Carbon products followed by a short talk and a very active question period at the second meeting on December 12th. Mr. Vushneck of Lincoln Electric (Canada) Limited was the speaker at the third meeting, January 16th, and naturally his topic was his company's policy of "Incentive Management." This meeting was held in conjunction with the Junior Branch of the Ontario A.S.M.E.

The final event of the year was the Annual Banquet held at Diana Sweets, Bloor Street on Wednesday, February 19th. An excellent dinner was followed by a highly interesting address by Dr. Otto Holden of the Hydro Electric Power Commission of Ontario. Dr. Holden was the honorary Chairman of the Club during the year and his willing acceptance of tasks and his useful suggestions were greatly appreciated.

Field trips were arranged for the Seniors on two occasions. DeCew Falls power development project (remember that lunch too!) was visited on November 8th. John Bertram and Sons and the Steel Co. of Canada plant at Dundas and Hamilton respectively were viewed on February 19th. Both trips were completely successful and the cry was for more.

Unfortunately difficulties of transportation (and the press of work), precluded joint meetings with the Ajax division of the Mechanical Club. The Executive of the Mechanical Club of 1946-47 express the hope that closer liaison may be maintained between Ajax and Queens Park next year and in the same breath wish to thank the members of the Mechanical Club for their support.

WM. G. GANSLER,

ARCHITECTURAL CLUB EXECUTIVE

S. Samuels; W. A. Winslade; Mrs. S. F. T. Rounthwaite; H. Chapman; D. K. Jackson.
R. P. Mitchell; Miss J. G. Robinson; N. H. McMurrich; P. C. Sears.

ARCHITECTURAL CLUB

CLUB "TRANSACTIONS" THIS YEAR HAVE BEEN MANY AND VARIED. The limited space makes it necessary to list the more important of these in telegraphic form. We have:

Established correspondence with Architectural groups in seven other countries.

Held an Interfaculty Forum on Town Planning.

Listened to Mr. Walter Dorwin League, leading American industrial designer.

Taken several field trips, the brightest of which was a luncheon and tour given by the Toronto Brick Company.

Conducted a survey in liaison with the O.A.A. to facilitate student summer employment.

Sponsored His Excellency Hon. Ray Atherton, U.S. Ambassador to Canada, to speak at a general meeting of the Engineering Society.

Designed, executed and installed (with kind assistance from other departments) the decorations for School Dinner, School Nite and the School At-Home..

Other matters pending have not taken place at the time of writing, but may the writer take this opportunity of expressing his thanks to the members of the staff and to those of the student body who made this year possible by their co-operative assistance.

Ajax Architects have, of course, run their own show and under the leadership of Mr. Hart Massey, had a very successful year. Even with the dark shadow of accommodation over our head, the staff and students of Queen's Park look forward to welcoming them to Toronto next October.

N. H. McMURRICH.

ENGINEERING PHYSICS CLUB EXECUTIVE

A. D. Misener; M. G. Ryan; B. P. Stoicheff; W. R. J. Brown; R. F. Galpin.

ENGINEERING PHYSICS CLUB

THE ENGINEERING PHYSICS CLUB HAS HAD A FULL SCHEDULE of events this year. Three field trips were held in addition to the regular meetings.

The first club activity was a field trip to the Canadian Broadcasting Corporation Station C.B.L. at Hornby, Ontario on Friday, October 11th. The workings of the transmitter proved very interesting as did the boisterous bus ride.

A meeting was held in Hart House on November 14th, at which Dr. Lucas of the Department of Pharmacology spoke on "Firearms." The talk was very well received by everyone at the meeting.

On December 4th, a second field trip was held for the fourth year of the course, to the Radio Valve Company of Canada. The manufacturing procedure followed in the construction of receiving tubes and miniature types was shown.

The Canadian Arctic was the subject of Professor J. Tuzo Wilson's talk at the second meeting of the club on December 17th. Colonel Wilson was a director of the Musk-Ox exercise of the Canadian Army and illustrated his talk with slides and movies from this expedition.

Professor V. G. Smith spoke at the third meeting of the club held in Hart House on January 21st. Movies and slides illustrated his talk on "Modern Computing Machines."

A joint meeting of the Ajax and Toronto clubs was held on Friday, February 28th, at Diana Sweets restaurant. Mr. Dobson of the Hydro Electric Power Commission was the guest speaker, at this meeting. After an excellent dinner, a colour movie was shown and Dr. Dobson gave a most interesting talk. This meeting was the first opportunity the two clubs had, to get together and meet one another.

The final meeting of the club is being planned for the first week of March.

The executive of the club is to be congratulated for its help in making the club's activities run as smoothly as they have. The greatest success is wished to the future executive.

W. R. J. BROWN

INDUSTRIAL CHEMICAL CLUB EXECUTIVE

L. to R. Back Row: E. K. Brickenden; W. E. A. Rispin; J. A. Walker.
(Sec.-Treas.) (Vice-Chairman) (3rd. Yr. Rep.)

Front Row: M. E. J. O'Loughlin; W. C. Macdonald.
(Chairman) (Hon. Vice-Chairman)

INDUSTRIAL CHEMICAL CLUB

THE ACTIVITIES OF THE INDUSTRIAL CHEMICAL CLUB THIS YEAR fell under two main headings, (1) meetings to supplement the course, and (2) field trips to industries studied in lectures.

The first of the educational series took place at the Waltsingham (Dancing Pig) Hotel on November 12th when the Annual Smoker was held. On November 26th, Dr. A. E. R. Westman of the Ontario Research Foundation was guest speaker at a class room meeting where he delivered a very interesting address on "Research in Industry." After we had all recovered from the Christmas holidays and their aftermath, the exams, a dinner meeting was held on January 22nd at Hart House, at which Mr. F. C. Lantz of Imperial Oil Limited spoke on "Petroleum as a Career for Chemical Engineers." This was of particular interest to those of us in fourth year who must soon work for our living.

At the time of writing, another dinner meeting at Hart House is planned for the end of February. The Club year will be officially closed at the banquet which will bring together members of both the Ajax and Queen's Park Clubs, in the early part of March.

On the morning of November 30th, the fourth year set out by bus and car for Chatham to visit the Dominion Sugar Refinery. That evening the cavalcade journeyed to Sarnia, where they inspected Port Huron's night clubs in preparation for tours through Imperial Oil Limited and Polymer Corporation the following day. Later that night the weary band, with their thirst for knowledge somewhat quenched, arrived back in Toronto. During the first week in December, Ontario Pulp and Paper in Thorold were hosts to the graduating class.

The third year had several interesting field trips through plants in the city and vicinity. Canada Malting, O'Keefe's Brewery and B.A. Oil Refinery at Clarkson were subjected to close scrutiny during the year. The class of 4T8 has a trip to one of the various soap manufacturers scheduled for the last week in February.

This year the Chemical Club revived an old custom by running a bar at the annual School At-Home. Particular praise should go to those intrepid scientists who kept the unit functioning during the dance.

In closing, your chairman wishes to extend to the executive and members his thanks for their co-operation during the past year.

M. E. J. O'LOUGHLIN,

ELECTRICAL CLUB EXECUTIVE

Standing L. to R.: B. F. Brown, A. D. Blachford, W. H. Beckett, N. R. Millen, K. S. Leeson.
Seated: Professor L. S. Lauchland, D. J. Glenn.
Absent: Mr. A. H. Frampton—Honorary Chairman.

ELECTRICAL CLUB

THE ELECTRICAL CLUB THIS YEAR FOUND ITSELF IN TWO CAMPS with the larger group at Ajax. Two separate Clubs functioned as it seemed impractical to combine the two in view of the large numbers involved.

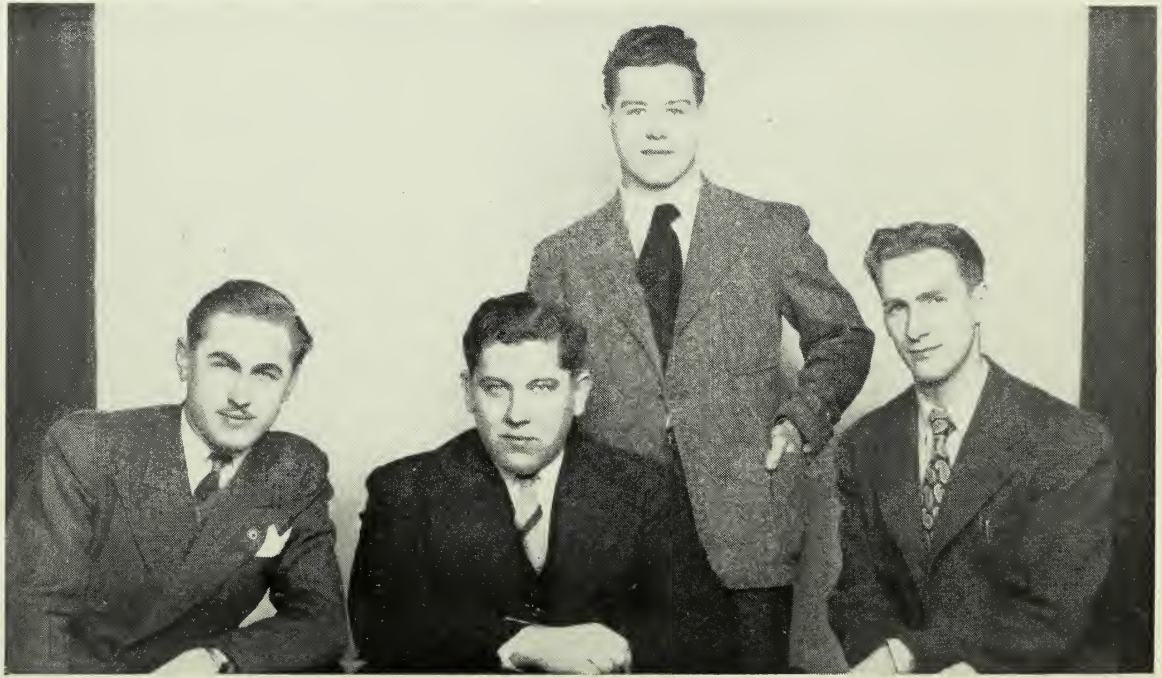
The Toronto section of the Club enjoyed field trips to Queenston and to the Canadian Westinghouse Company and the Steel Company of Canada in Hamilton. Further field trips are planned to local plants including Rogers Radio and Radio Valve Company. It is hoped that the variety in plants visited will give the Electrical Club members an all round picture of their chosen work.

An excellent address on "The Romance of Niagara" was presented by the Honorary Chairman, Mr. A. H. Frampton, of the H.E.P.C., at a Hart House dinner meeting held early in December. An off the campus smoker is in the planning stages now as we enter February.

One of the highlights of the Club's activities this year was the formation of an A.I.E.E. Student Branch. Last year's Chairman, Mr. G. R. Slemon, was instrumental in getting the Branch underway and in planning a series of Employment Talks as the inaugural activity. These talks are to be delivered by men prominent in the various aspects of Electrical Engineering as an aid to the undergraduate in planning his future.

The executive extends to their successors best wishes for a successful year. A wonderful opportunity for an extension of Club activities should present itself with the arrival from Ajax of so many of our members.

D. J. GLENN



CERAMICS CLUB EXECUTIVE

L. to R.: R. A. Tothe; Prof. P. M. Corbett; F. M. Cullen; A. Trott.

CERAMIC CLUB

THE SECOND YEAR AS A RECOGNIZED ORGANIZATION ON THE campus, proved to be a very busy and progressive one for the Ceramic Club. Affiliation with the Engineering Society was the highlight of the current proceedings. This placed the Ceramic Club on a par with similar clubs in allied Engineering departments in the Faculty.

Field trips constituted a major portion of the Club activities for the year. Some of the plants visited were—National Fireproofing Co., Aldershot; National Sewer Pipe Co., Swansea; Standard Sanitary and Dominion Radiator Limited, Toronto; A. P. Green Ltd., Toronto; Canadian Potteries, Oakville; Norton Abrasives, Hamilton; Dominion Glass Co., Hamilton; and General Ceramics Ltd., Hamilton.

General meetings were held throughout the school term to which prominent men in the industry were invited to address the students.

The climax of the activities came with the annual convention of the Canadian Ceramic Society at the Royal York Hotel, Toronto, which all the student Ceramic Engineers attended. At the meeting, the club was presented with a charter by the President of the American Ceramic Society, in response to an application submitted to this Society, thereby forming the first student section to the American Ceramic Society to exist outside the United States.

For the first year since the inauguration of the course in Ceramic Engineering at the University in 1924, the graduating class will be graduated as Ceramic Engineers and not as Metallurgical Engineers, as had been previously the case. For this we would like to pass on our appreciation to Mr. R. J. Montgomery, who was largely responsible for this progressive step.

Before closing I would also like to pass on our appreciation to our new Department Head and Honorary Chairman, Professor Paul M. Corbett, for the encouragement and support offered by him in the interests of the club.

Again I say, for the Ceramic Club, the year 1946-47 was certainly an important one.

ROBERT A. TOTHE,

AERONAUTICAL CLUB EXECUTIVE

Back Row: L. to R.: W. T. Heaslip W. G. Carter; W. A. Goodall; G. V. Bull.
Seated: E. L. Davies; Prof. T. R. Loudon.

AERONAUTICAL CLUB

THIS YEAR SAW THE FORMATION OF THE AJAX BRANCH OF THE Aeronautical Club for the benefit of the first and second year members of the course and reports from that quarter indicate a very successful year.

Club activities started out with a field trip to Bell Aircraft at Niagara Falls, N.Y. which, although proving interesting enough was made an undeniable success by the subsequent touring of Buffalo and vicinity. In November an afternoon field trip was taken to De Havilland Aircraft where the construction of the Fox-Moth and of the Chipmunk was studied with interest.

In December our first general meeting was held at which Dr. Lord of the Department of Mechanical Engineering gave a short talk on the association of Professional Engineers of Ontario. A similar talk was given on the Engineering Institute of Canada by Messrs. Self and Whitefield. Following the speeches, a film was shown on the design, construction and history of the DeHavilland Mosquito and a second shorter film on the Vampire, Hornet and Dove.

During the first week in February our second meeting was held in Hart House with Mr. Hiscocks of DeHavilland Aircraft as guest speaker. His topic was the design of the Tailless Glider at the National Research Council which proved very interesting indeed. This was followed by a short movie on the Auro Lancaster.

At the time of writing, plans are well advanced for the annual dinner meeting to be held in the Graduates Dining Room at Hart House. The guest speaker of the evening is to be Mr. E. H. Atkin, chief designer for A. V. Roe (Canada).

The Aeronautical Club heavily endorsed the appointment of Dr. Patterson as aerodynamics professor in the Department of Aeronautical Engineering. Dr. Patterson is a man well known in the circles of high speed aerodynamicists and will be, we know, a great asset to the department.

In conclusion, we wish to thank the executive and members of the club for their co-operation in the past year. This year was one beset with many difficulties due to small enrollment, but the enthusiasm of club members more than made up for its small membership.

E. L. DAVIES,

ENGINEERING & BUSINESS CLUB

J. M. Milsom; A. Brownridge; J. H. Mathers; K. J. Kenyon.

THE ENGINEERING AND BUSINESS CLUB

THE ENGINEERING AND BUSINESS CLUB WAS ORGANIZED LATE last year by the small but ambitious group in Course 11, who were previously under the wing of the Mechanicals. The lone event for 1945-46 was a club dance at the Hotel Embassy, which was much enjoyed by all.

This year, though, we've unfolded our rapidly drying wings, and flown farther afield in a more serious frame of mind. During the fall term the E. and B'ers organized (in their own time, if you please) three interesting field trips. The first, to General Motors in Oshawa, gave us a close-up of assembly line and mass production methods; the second, to the British American Oil Plant at Clarkson, introduced us to the refining processes of that precious "black gold"; the third, to the Maclean-Hunter Publishing Company in Toronto, showed us the intricacies of modern printing and magazine advertising techniques. The spring term's trips are still in the planning stage, but we hope to visit the T.T.C. Workshops and possibly one more manufacturing concern.

Now for the social sphere. The more energetic members enjoyed an afternoon of golf at the Shaint Andrew'sh Golf Club, completed by a shtimulating nineteenth hole. Present plans are to shut the door on 1946-47 with another dance similar to last year's.

We would like to take this opportunity to welcome our younger but bigger brother to the home campus next year, and we hope that our greatly increased membership will enable us to fill our place among the older clubs.

J. M. MILSOM

A. S. M. E. STUDENT BRANCH:

Back Row: W. G. Ratz; D. A. Saunders.
(IV Yr. Rep.) (III Yr. Rep.)

Front Row: H. S. Dand; R. W. Stedman; Prof. I. W. Smith; H. Dederer. J. A. Whitten.
(Treasurer) (Chairman) (Hon. Chairman) (Vice-Chairman) (Secretary)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS STUDENT BRANCH

THE MOST STRIKING FEATURE OF THE BRANCH THIS YEAR HAS been the greatly increased enrolment. With the inclusion of Ajax we have 214 members. This fact has made the planning of meetings much easier.

The Executive have followed a policy of complete co-operation with the Mechanical Club. All meetings have accordingly been joint meetings, with the two Clubs' Executives organising alternate meetings. This has been found to be an excellent plan and is recommended for future years.

The first meeting was a supper meeting held in Hart House, followed by the presentation of an excellent motion picture by the Goodyear Rubber Co. of Canada, entitled "The Way Over the Mountain."

The second meeting was also a supper meeting. The Carbon Co. of Canada entertained the members with a film showing the manufacture and installation of carbon electrodes.

Mr. M. Bushnick, General Manager of the Lincoln Electric Co. in Canada, was the guest speaker at the third meeting. This meeting was attended by the members of the Junior Branch and was the best attended meeting of the year, with a crowd of one hundred and fifty members and guests. Mr. Bushnick's subject was "Incentive Management." This topic proved most interesting, as the question period proved. A movie entitled "The River" was also shown at this meeting.

It is proposed to hold another meeting with the Mechanical Club which will probably take the form of a banquet.

The Executive regrets that the Ajax members have not been able to attend the meetings held in Toronto. In order to make up for this in some way, it proposes to hold a Speaking Competition at Ajax in the second week of February where the Ajax members will compete for cash prizes by delivering short speeches.

ROBERT W. STEDMAN.

DEBATES CLUB

L. to R.: W. A. Dimma; B. P. Stoicheff; C. A. Fry.
Absent: H. Koehler.

DEBATES CLUB

THE DEADLINE OF CAMPUS PUBLICATIONS BRING SHARPLY INTO focus the realization that another year of activity is drawing to a close. In the past few months the S.P.S. Debates Club has established a record which, it is to be hoped, will remain unique.

Most undergraduate engineers admit the desirability of training and practice in public speaking as an asset in the highly competitive field of professional and technical employment. It was to provide this training that the S.P.S. Debates Club was organized, and in recent years, it has broadened its scope to serve as a sounding board for the opinions of Schoolmen generally.

With this background, it is difficult to admit failure. But there is no alternative. During the current session, it has proved impossible to stimulate enthusiasm for debating among more than a handful of students. Attempts to hold formal debates have proven fruitless, and the contribution of engineers to debating this year has been confined to their participation in Interfaculty debates, and to representation on the Intercollegiate and Interfaculty committees of the University of Toronto Debating Union.

Possibly the absence of first and second year men from the Toronto campus has been part of the reason for the apparent lethargy, since these years have previously supplied much of the debating talent. In any event, only the future will show the extent to which the large numbers now at Ajax will participate in this absorbing activity. May the next year be brighter than the past.

CYRIL A. FRY

TOIKE-OIKE STAFF

W. R. J. Brown; J. R. Wilkie; R. A. Boorne; D. G. Philpott; J. C. Cringan.

TOIKE OIKE

TOIKE OIKE SUFFERED A GREAT SET-BACK THIS YEAR WHEN ITS editor Bob Cooke was forced to leave university in December. Bob worked energetically to produce the Freshman Reception edition and the School Nite program and had great plans for the annual magazine edition.

The usual editions were published every now and then this year. The Freshman edition had the largest circulation in Toike Oike's illustrious history. The Freshman Reception and School Nite editions followed in rapid succession.

The second term saw the birth of the somewhat frivolous School At-Home edition, heralding this campus event of the year. This was followed by the Elections edition.

The annual Magazine Edition was somewhat delayed this year due to the change of editorship. Publication is expected by the middle of March, and we hope you will find it worth waiting for.

With the Graduation edition to complete the year, we close the covers of volume XXXVIII, forever placing it in the dust with its Ancestors. And so we put away our pen.

W. R. J. BROWN

SCHOOL DINNER COMMITTEE

Back Row: N. Prochnicki; R. G. Tredgett; P. E. Kevill; J. A. Whitten; D. R. Yeomans; N. H. McMurrich;
Front Row: M. J. McAuliffe; G. W. Beatty; J. A. Brown; C. W. Daniel; F. A. Huycke.
Absent: G. O. Machum, E. N. Banks; D. G. Philpott.

FIFTY SEVENTH ANNUAL SCHOOL DINNER

FOR THE FIRST TIME IN MANY YEARS, THE SCHOOL DINNER WAS not held in the Great Hall at Hart House. Instead, due to the establishment of the first and second years at Ajax, the third and fourth year men were conveyed, by means of buses to that campus on October 29th, 1946.

The characteristic appearance of the gymnasium was readily changed with the audience of 550 Schoolmen, the head table on the stage and an appropriately decorated backdrop.

The guest speaker was to have been Mr. D. C. Coleman, President of the C.P.R. and this led to the theme of the Dinner. However, Mr. Coleman was unable to attend, but in his place came one of the most distinguished after-dinner speakers on the continent, Mr. L. W. Brockington, K.C.

MR. L. W. BROCKINGTON, K.C., AT SCHOOL DINNER

After a well prepared meal, served by caterers, the Schoolmen and guests listened to a "master of eloquence" deliver a remarkable address on "Canada", why we should be proud of her, and what future she offers to young engineers.

Following Mr. Brockington's address the Dinner guests relaxed with some light entertainment provided by a magician.

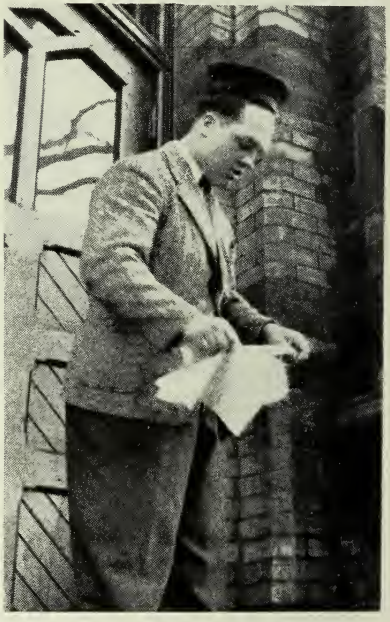
The President of the University presented the scholarships to the "Honour boys" of School after which the list of Gold Key awards was read by the Chairman, Bill Daniel.

Toast to the University by Ted Hodgson, second vice-president at Ajax, was returned by President Smith and the toast to School by Gord Beatty, Ajax branch first vice-president, was replied to by Dean Young.

The evening's proceedings were formally brought to a close with a rousing Toike Oike, voiced by all the Schoolmen.

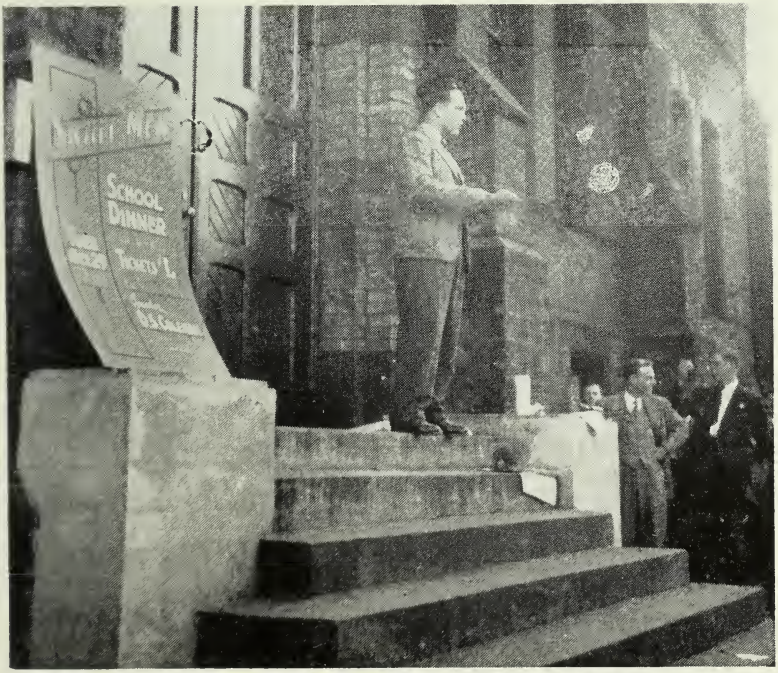
This successful event was the first of many such occasions when the two branches of the Engineering Society combined to bring to the Schoolmen the realization that although separated by 25 miles in distance they were joined together by common studies and a common aim.

JIM BROWN



"WAT'S DA BID?"

GUNNER BROWN: "FIRE ONE"

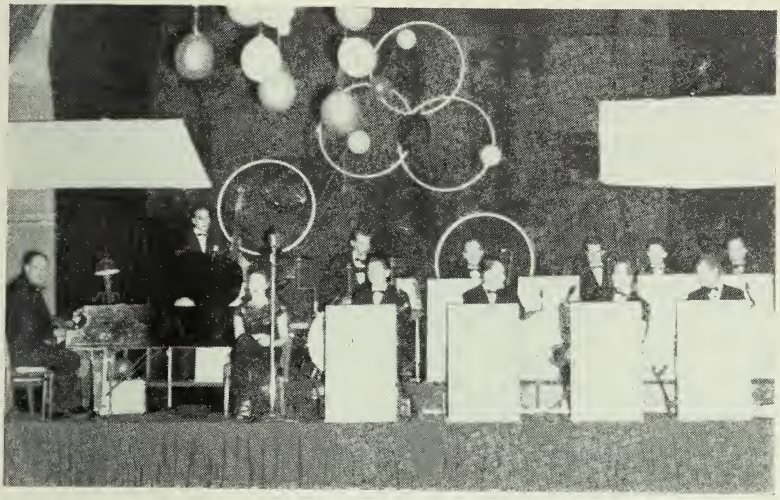


AUCTIONEER ROD SMITH

SCHOOL AT-HOME

Back Row: M. E. J. O'Loughlin; T. L. Hennesey; D. J. T. Glenn; M. M. Smith; R. J. Smith; J. A. Whitten; D. R. Yeomans; N. H. McMurrich.
Front Row: M. J. McAuliffe; C. W. Daniel; J. A. Brown; P. E. Kevill; F. A. Huycke; J. B. Adams.
Sitting: W. F. Patterson; H. W. Blakley; A. A. Weir; R. S. Hill.
Absent: K. C. Hendrick.

SCHOOL-AT-HOME



Music by Bogart

The pinnacle of the social life at school, this year was reached by the School At-Home which took place on the Convention Floor of the Royal York Hotel, January 30th. The dance maintained the prestige of past School At-Homes and from many quarters came the opinion that it was the foremost social function of the University during the year.

A big jump was taken by the committee in attempting to bring back one of the only too few formal occasions of University life, by designating the dress as formal or semi-formal. It was hoped that this would pave the way to a completely formal dance as soon as the existing conditions relax.

Perhaps the highlights of the dance were the marvelous decorations prepared by the Architects. The Concert Hall was decorated under the theme of "Engineering of the Past," and the Banquet

Hall as "Engineering of the Future." Twenty-two murals, two representing each department, were evolved and illuminated by a display of very clever lighting technique. The time and energy spent in the decorations was enormous but their importance was amply proved by the measure in which they contributed to the success of the event.

The orchestras of Ellis McLintock and Frank Bogart provided very danceable music while Johnny Perkins at the piano in the Crystal Ballroom played requests from Bach to Boogie-Woogie for those who wished to "sit the next one out."

The Boys In The Back Room

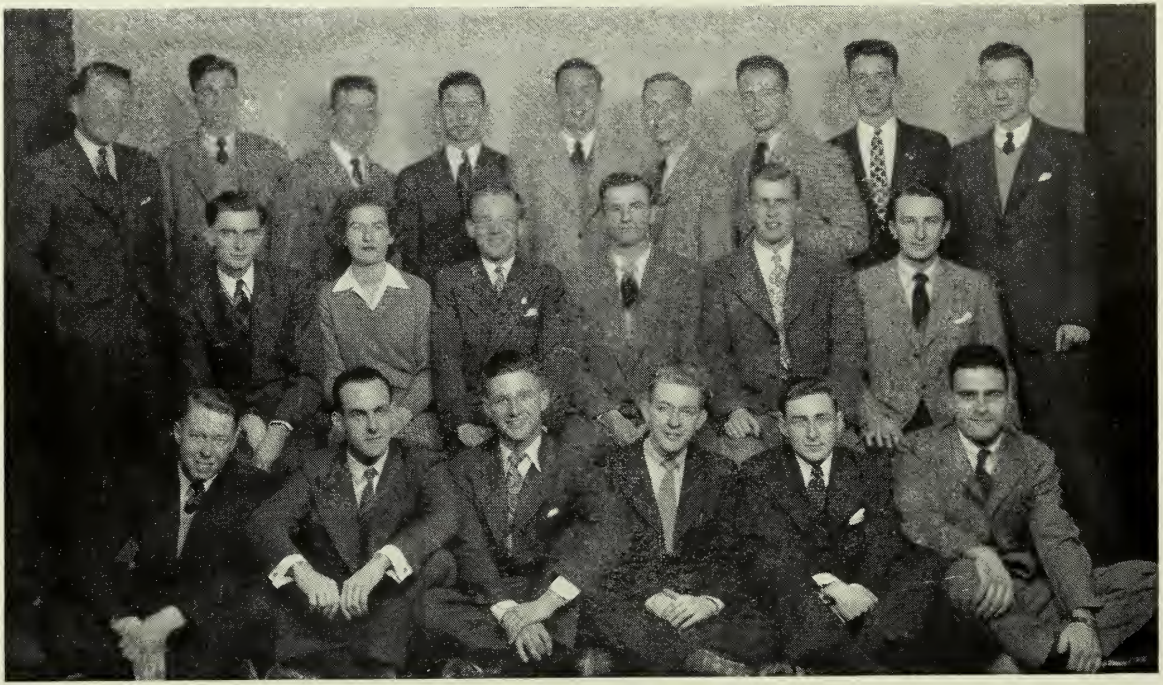
A new stunt was also attempted by the committee, that of showing movies in the Concert Hall. The couples danced to and watched Tex Beneke with his latest arrangements; while at intermission, in keeping with the "Gay 90's" atmosphere of the Concert Hall, "Slapstick Comedy" and a "Barber Shop Quartet" were presented on the screen. These novelties proved very interesting and effective.

Meet Jee-Zelle

For those couples who felt the need of liquid refreshment, punch, was served, produced from the condensers and stills of the Chemical Club Bar. Several novelty dances were provided and at intermission the Schoolmen and their partners were entertained by "Songs by Giselle" and by "Doug Romaine," comediane—par excellence.

The entertainment moved at a fast interesting clip throughout the evening and at 1 o'clock, the very weary but happy crowd headed for home, with pleasant memories of a School At-Home which once again displayed to one and all what real "Skule Spirit" meant.

J. A. Brown,



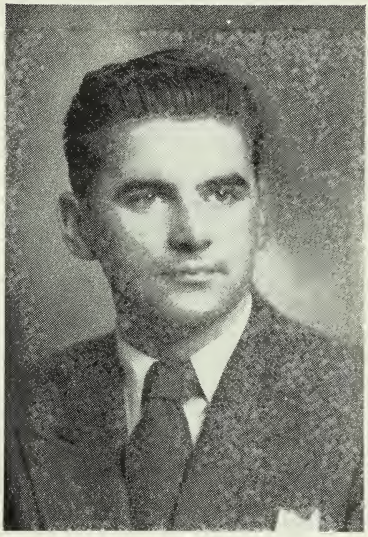
SCHOOL NITE COMMITTEE

Back Row: (L. to R.)	G. W. Beatty; P. E. Kevill; T. L. Hennessy; A. B. Chapman; J. A. Whitten; D. R. Yeomans; W. A. Dimma; H. S. Dand; J. B. Adams.
Middle Row: (L. to R.)	M. J. McAuliffe; Miss J. G. Robinson; J. A. Brown; C. W. Daniel; F. A. Huycke; W. Tronianko.
Front Row: (L. to R.)	C. B. Harrop; B. A. McLeod; D. T. Sloane; C. A. Fry; R. L. Doner; R. N. Saba.
Absent:	W. M. Flanagan; D. G. Philpott; R. E. H. Cooke; Mrs. L. A. Garriock.

SCHOOL NITE

THE NINETEEN-FORTY-SIX VERSION OF THE IMMORAL—UH-immortal that is (since the Caput took over, anyway) immortal School Nite Revue ran the gamut from Hell to the haven of a Whitney Hall bedroom.

The show opened in the Engineers Club—the K.C.R. Engineers were there, the quartet was there, Kilroy was there. Kilroy was not only there but was captured and was being grilled, when in a burst of smoke and fire there arose a Lady from Hades—a flaming beauty. Promised more of the same by Kilroy the engineers went to Hell.



W. M. FLANAGAN

"OUT OF THE FRYING PAN"

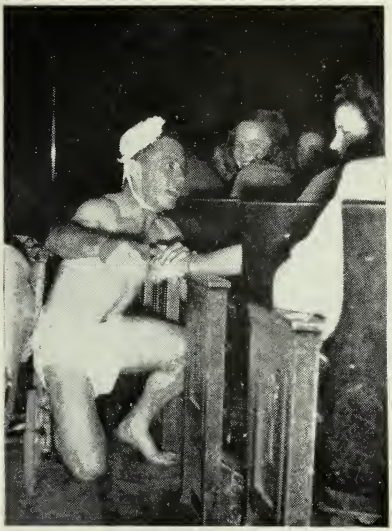
"Helles Belles"

Duly registered there by Registrar Hiddenbottom, they demanded their forty beers. Kilroy beckoned and the tall chorus, about half a ton of pulchritude, danced daintily in, executing a triple faux pas followed by a double entendre.

Shave?

The Engineers, having repaired Kilroy's weird and wonderful atom-powered, super deluxe Mole (complete with modern conveniences) bored their way back up to earth, and by a remarkable coincidence happened to reach the surface in a bedroom of a girl's residence.

There Miss Ada Time, Miss Bea Haven, and Miss Take were playing a revealing scene. What followed was too much for Kilroy, for in a breath taking finale he went back to Hell.



SERVICE A LA HENNESSY

Walley Tronianko's band arrangements, sizzling hot and in the groove kept the crowd jumping throughout the show, while "Spike" Hennessey and his zany cohorts put on an act between scenes which rolled the crowds back into the seats from the aisles where the stage antics of Pete Kingsmill, Rick Hill, Herb Dederer, Red Boorne and Lionel Ginsler had put them.

SMITTY AND MUDDIMAN—US GIRLS

Special mention must be made of the girls, who did a magnificent job both on the stage and behind the scenes. True Skulegirls everyone.

And out of the limelight Ramsay Saba's crew worked miracles with all the complicated backstage paraphernalia.

In fact bouquets to all for what is hailed as one of the best shows in School history.

BILL FLANAGAN,
Director.

Gull Lake

SURVEY CAMP - GULL LAKE - 1946

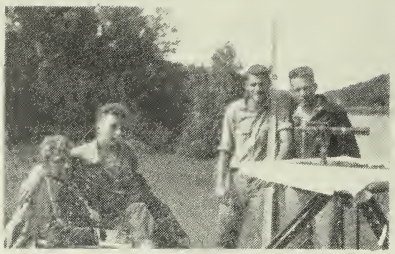
THIS YEAR THE MINERS AND GEOLOGISTS HAD THE GULL LAKE Camp to themselves. Though small in number they made their presence felt in the surrounding country.

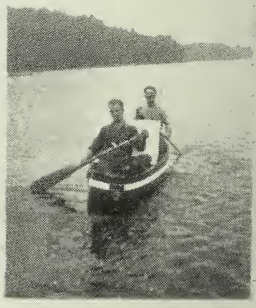
The only mode of transportation was Thomson's "Pedro." However Pedro he get hot one day and burnt out a few rods. As a result, Deer Lodge, The Boat, Wig-a-mog etc. were not too frequented. Some of the boys managed to get in once or twice a week via the thumb but the traffic on Highway 22 isn't too heavy at 3 a.m. Naturally every Tuesday and Thursday night the boys got into Minden. (It was rationed then.)

Wonder if Coons ever hired that Indian runner to carry his letter to "Charles." By now Diet must have Macklin's dog in the pound—too bad Temple didn't wear his rubber boots that day. Has Whitham forgotten his walk along the Haliburton Highway yet? Remember the day the Club A.C. delivered the ultimatum to Tusker and how those side-burns came off a few days later. Perhaps the memory of the Bunk House Brawl isn't too clear in some minds but they tell us that Quinn ran a fast mile that night before turning up behind the piano. We mustn't forget Max and his super sack or the arguments when Smitty and Fearless were bridge partners. Remember the case of McLeod the frustrated geologist and Hank's mutterings concerning one female "Bavarley." The excursions in the University Launch didn't go over so well with the C.O. and his corporal did they? Time has proven that Redsell's celery diet the last few weeks wasn't adequate. The golfers will remember Tiger's favourite *out crop* of the Shield and his famous departing words "Wait till I have a . . . . . !"

Every morning the boys were awakened by a bell, all except Smitty that is, and hit the sack at an hour designated by certain habits of one "Flaker" Godfrey. Good floor show the night of the brawl wasn't it.

Summing up we can say that the perfect weather, the splendid food treatment, and the social functions blended with a little surveying and geology all made a highlight in our university years.





SURVEY CAMP

SURVEY CAMP '46

IT WAS A RAINY SATURDAY, WHEN THE FIRST FEW "KEEN TYPES" arrived at the new survey camp for the Civils, up at Lake St. Nora in Haliburton County. By the following Tuesday or Wednesday most of the boys claiming 4T8 to their fame, and a sizeable delegation of delinquents from 4T7 had blown in, and the profs suggested that we do a little work. Every means of travel was used to get there, including a stage-coach known as the Algar Bus Lines.

Everybody went through the usual motions of turning fine adjustments, levelling rods, parroting field notes and making silly little drawings. Most of the boys found this pastime distracted them from their normal activities, and gave it an appropriate allotment of time.

Doesn't it make you smile when you think how religious the boys were, that is, their prayers for rain when Barney used to make his morning rounds, and those long hours in the sun made everybody look like real engineers. As for the married crew, it often meant long evenings of bridge playing and letter writing—Eh!—what's that about cottages up the lake?

And will you ever forget—Redfern's favourite fruit,—Jake (The Body) Robbins' Gray Goose and choruses of Hey-ba-ba-re-bop—Those Glenmount excursions—The "buying trips" into Huntsville, and by the way boys, how far did a D.V.A. cheque go at that Blackjack table? We hear that Hayman just received delivery on his truck from the Dorset garage, and Moose, does your wife let you play the "Bells of St. Mary's" on a bedfull of coke bottles at home?

As for the colonials, they showed real camp spirit, even though they missed the foremost export of their native lands. Remember Bill's opening bids of 5 and 6, and at the end of the season Lance was showing the boys how to run back kicks.

Questions which haven't been answered yet are: Why did Knobby's gang always keep a guard on that back room refrig? Did Jackson ever get out of the cement mixer? And would L.G.T. have been engaged in Huntsville if he had had one more spaghetti dinner? As for that beach brawl on the last Saturday night, who put those cement buggies in the lake Coop?

So set up the proverbial forty sometime boys and—REMEMBER—Survey Camp '46.

"TIMEFORANIP" SHORT

SURVEY CAMP

ELECTION DAY


ENGINEERS

GRADUATE'S ALBUM
4T7

ENGINEERING SOCIETY

THE UNIVERSITY OF TORONTO

IV CIVIL ENGINEERING

6th Row: J. W. Langlois; R. K. Cleverdon; V. A. Harrison.

5th Row: W. G. Moorehead; C. D. Boothe; W. R. Macke; J. Tuteky; J. H. Jackson; J. D. Smith; R. A. Weir.

4th Row: J. D. Kean; T. L. Newell; T. A. McCracken; H. M. Kolesar; T. L. Hennessey; J. B. Phelan; K. H. Sharpe.

3rd Row: R. J. Hallawell; R. F. D. Bosworth; R. J. Hansen; J. H. C. Massie; C. S. Dunn; F. C. Totino; R. G. Tredgett.

2nd Row: J. F. Walker; L. B. Rose; E. F. J. Clark; A. F. McCoubrey; J. G. Robinson; H. R. Stott; E. J. Thompson; P. M. Sandham.

Front Row: W. A. Scott; G. R. K. Lye; R. J. Smith; Miss M. B. Lamont; Prof. T. R. Louden; Prof. C. F. Morrison; R. F. Boyd.

Absent: A. F. Fassel; A. S. Williamson; G. E. Dans; G. C. Hunt.

IV MINING AND MINING GEOLOGY

Back Row: G. S. W. Bruce; P. Tymochko; J. Phelan; E. Pye; C. W. Daniel.
Centre Row: C. W. Eggert; J. Cummings; J. King; J. A. Simpson; M. R. Davey.
Front Row: B. J. Haynes; Prof. Mr. Hewer; Prof. C. G. Williams; Prof. S. E. Wolfe; J. Nichols; J. Giovanetti.

4TH YEAR MECHANICAL ENGINEERING

8th Row: J. A. Brown; D. R. Yeomans; W. L. Elliott; K. C. Hendrick; R. L. Doner; J. A. Freeberg; R. G. Meschino

6th and 7th Rows: C. B. Harrop; K. Campbell; W. A. D. Parrott; J. W. Martin; M. B. Rice; W. J. Allcock; W. G. Ratz; G. I. Russell; R. R. Schieck; A. K. Bunnell; T. J. Hogg; J. F. Marr; E. O. Bridges; W. A. Payne; S. W. Forstrom; D. C. Elves; R. Stedman.

4th and 5th Rows: S. S. Wier; T. J. Cudbird; O. Zanata; C. Mark; S. Dand; D. G. Ross; D. Pinkus; W. M. E. Clarkson; S. H. Tucker; B. P. Dolmont; K. Bald; B. H. Zarnett; J. O. Miller; W. A. Woodcock; J. Whitten; H. E. Roberts; R. N. Saba.

3rd Row: W. S. Gerrie; H. Berwick; A. Paulin; A. J. Prell; G. Rice; W. B. H. Chong; L. Breen; W. N. Bobbie; R. S. Alberts; W. G. Mayberry; T. A. Ewing.

2nd Row: J. T. Kerfoot; D. F. Quan; S. Moses; V. V. Sinitsin; G. Campbell; I. Burns; M. Allen; R. C. Parker; G. W. Shorter; J. P. Fleming.

1st Row: Prof. R. C. Wiren; Prof. W. G. McIntosh; Prof. E. A. Allcutt; Prof. G. R. Lord; Prof. I. W. Smith; Prof. L. E. Jones; Prof. F. G. Ewens.

V YEAR ARCHITECTURE

Back L. to R.: H. B. Kohl; M. Sklar; Mrs. C. F. T. Rounthwaite; B. G. Ludlow; H. G. Cole.

Front L. to R.: L. E. Venchiarutti; W. Tronianko; N. H. McMurrich; Professor H. H. Madill; R. H. Williams; R. E. Orlando.

ENGINEERING PHYSICS 1946-47

Back Row: G. Smith; D. G. Henshaw; J. R. Connell; Prof. K. B. Jackson; W. R. J. Brown.
Front Row: A. W. L. Segel; F. Weinberg; J. F. Whittaker; H. Teekman; B. Stoicheff; J. D. Baker; P. A. MacPherson.
2nd Row: A. Klarman; F. C. Carter; G. D. Garland; L. Sklar.
3rd Row: E. Teghtsoonian; T. R. Hand; G. B. Thompson; M. R. Sabiston; M. E. D. Ellis; S. F. Love.

IV CHEMICAL

8th Row: D. J. T. McNair, R. T. Howard; H. Young; W. J. Jarvis; A. E. Downing; J. Young; M. E. J. O'Loughlin.

7th Row: D. E. H. Hubbs; S. Jacobs; D. J. Forman; R. E. T. Fryer; N. Papazian; S. B. Sandler.

6th Row: J. W. Zink; K. S. Trevithanus; W. R. Houston, R. P. Singer; W. M. van der Voort; P. B. Mason; Prof. W. C. MacDonald.

5th Row: N. J. Emmis; A. H. Todd; H. F. Bartram; D. K. Reynolds; D. M. Steiner; R. J. Paterson; H. H. Mullinger.

4th Row: H. Alsberg; K. W. Baker; H. F. Donnelly; W. B. Marshall; M. Stubbins; J. B. Wallace; R. H. Routliffe; L. M. Tod.

3rd Row: W. E. A. Rispin; L. Butko; H. J. Hamm; D. E. Hanaham; J. W. R. Wilson; W. J. C. Wright; J. B. Cronyn; J. P. S. Roberts; J. M. Heron.

2nd Row: A. K. S. J. MacInnes; T. G. Sheridan; G. M. Dalton; C. AllumPoon; J. D. Hisey; G. A. Tamblyn; R. D. Morrison; J. J. Gray.

1st Row: H. C. Ballou; J. G. E. Miller; L. R. Farquhar; A. W. R. Butterworth; A. Zlatkis; Prof. J. G. Breckenridge; Prof. R. R. McLaughlin; Mr. A. M. Fitzgerald; R. D. Mosher.

Absent: W. D. Carrothers; Mrs. L. A. Garriock; K. H. Geiger; E. H. Hill; V. J. Ralston.

ELECTRICALS 1946-47

Front Row: Prof. V. G. Smith; Prof. A. R. Zimmer; D. J. Glenn; Prof. L. S. Lauchland.

2nd Row: W. C. Marcotte; R. W. Spafford; C. H. Lusk; K. J. Katchanoski; J. C. Roney; W. L. Scott.

3rd Row: W. R. Lewis; H. J. Mabson; K. S. Leeson; I. G. Hendry; C. E. George; G. R. Markow; C. Miall; W. S. Martin.

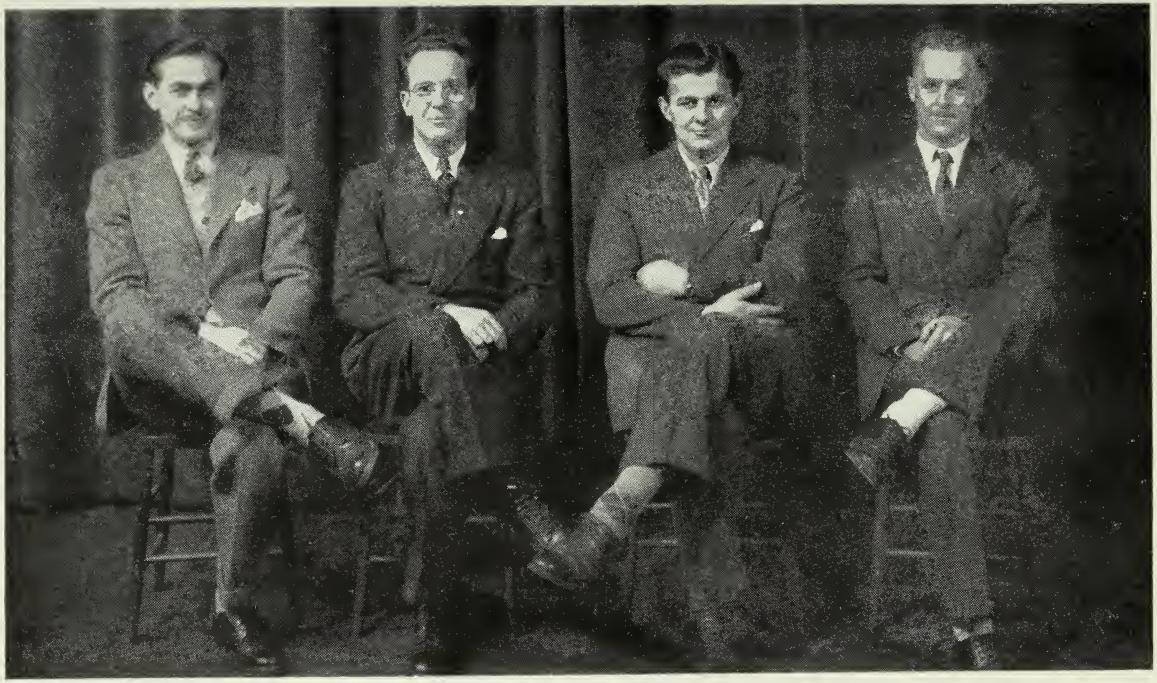
4th Row: B. Wasserman; W. C. Evans; P. R. W. Beatty; P. Bell; S. M. Robertson; A. Fortinsky; R. B. Stewart; H. Y. Okada; N. R. Millen.

5th Row: R. H. Duncan; J. H. Towse; K. R. McClymont; J. G. Taylor; L. A. Coles; R. R. Urquhart; G. R. Fairweather.

6th Row: Miss B. E. Meredith; B. H. McGregor; H. L. Webster; J. J. Dravis; W. H. K. McCullough; M. C. Wolfe.

Back Row: W. J. Anderson; R. J. Black; R. F. Seymour; R. S. Tate; M. A. Kilpatrick.

Absent: D. H. Storey; K. J. MacDonald; W. Kallio; C. E. Rickards; M. Ruschier; W. J. Stothers; C. G. Cooper.



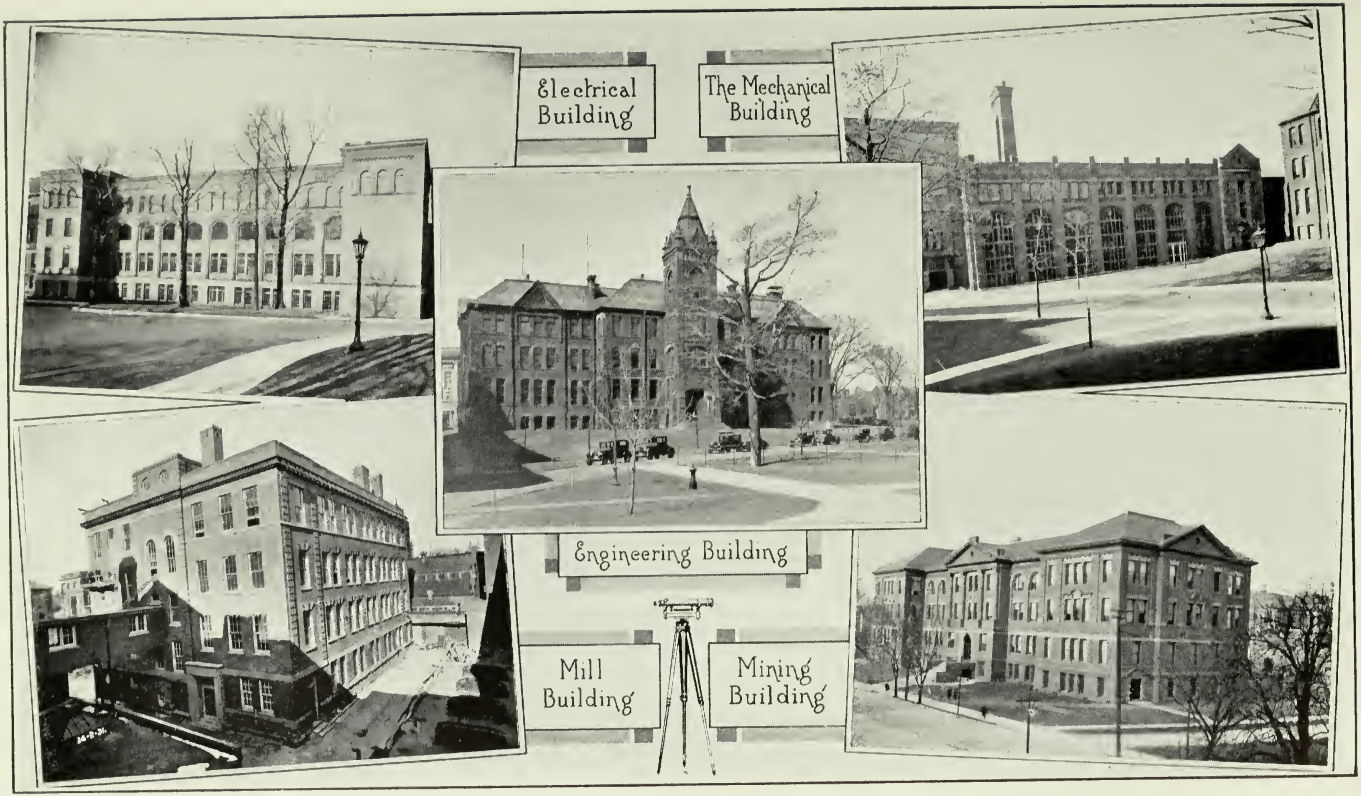
IV CERAMIC

L. to R.: R. A. Tothe; W. H. Jones; S. A. Potocny; J. M. P. McRobert.

IV YEAR AERONAUTICALS

Standing: (left to right) G. B. Thornton; L. E. Fraenkel; H. N. Shoji; D. H. Staples; W. G. Pidlubny; J. P. Foster; H. J. C. Keon; E. B. MacCuish; I. I. Glass.

Seated: (left to right) A. Jacks; R. I. C. Atkey; K. C. Livingston; Prof. T. R. Loudon; Mr. B. Etkin; E. L. Davies; W. T. Heaslip; D. Bitondo.


Electrical Building
The Mechanical Building
Engineering Building
Mill Building
Mining Building

CLASS 4T7 EXECUTIVE

L. to R. H. J. Hamm; D. G. Henshaw; T. L. Hennesy; R. J. Smith.

EXECUTIVE 4T7

President	T. L. Hennessy
Vice-President	R. J. Smith
Secretary-Treasurer	H. J. Hamm
Athletic Rep	D. H. Henshaw

4T7

THIS EVENTFUL SPRING OF 1947 BRINGS CULMINATION TO OUR days of School life. The last set of examinations will soon be over. We have suddenly, perhaps sorrowfully begun to realize that our student days are just about over.

During the last four years we have pulled together, our paths have run parallel; now they must branch out in many directions.

The years we have spent at school have been filled with incidents, never to be forgotten. By working together, living together, playing on the same teams, and enjoying the same social activities, we have developed the friendships, the acquaintances which will mean so much to us with each passing year. Our class may well be proud of the fine spirit of unity that has prevailed throughout our undergraduate days.

Let us all look forward to the renewing of old acquaintance in the future at Alumni activities and 4T7 reunions.

R. J. SMITH,

CLASS 4T8

HERE WE ARE AGIN AT THAT LOUSY TIME OF THE YEAR WHEN the old "Spring Fever" bug gets ahold of you and the Editor of the Transactions does his little bit to take away any interest you may have in exams. Not that I'm unfaithful to the good ol' class of 4T8, but here's wishing I had a very good friend who is a journalist and just loves to write up a story about our activities as a class for this past session.

Like every other third year, we started school last September with that gleam in our collective eye that says "Get out of my way, I'm really going to work for a change and not have to cram so much next April." That's what we said then!! Then came the rugby season and a few of us like Rudy Grass, Jim Grierson, Jack McReynolds etc., etc., went out to do or die for our favourite rugby team; the Blues . . . What could we do but go after them to London, Kingston and Montreal to cheer them on to further achievements. "That's OK," we said, "we'll really study when the season's over" . . Except for the week following our first big brawl at the Club Kingsway . . Just some little get together to give "John" some play so he wouldn't get to be a dull boy. Then Bill Flanagan thought the boys would like some more entertainment and took such famous Broadway Characters as Bob Muddiman, Red Boorne, Pete Kingsmill, Rick Hill, Wally Little, Bruce McDougal, etc., etc., and our diminutive rugby star Grass, under his wing and gave forth with two very good nights called "School Nite," one of the best acts that has been seen around here in years . . "Whewww" we collectively said . . "look whats here . . Xmas! ! ! ! Well, we'd better get down to studying" . . The great members of all our Interfaculty teams turned in their equipment and said "Well, next year for sure we'll win those old championship again. We can't be too selfish about keeping them anyway".

Christmas came and went, so did our exams and chances of passing, *we hope not* . . We gathered with fourth year at the Kingsway again. After all, the exams were hard work and we must not get dull . . "Oh hell that lab report won't mind waiting till tomorrow to get in with the other scabs." "What's one night?". Hockey games, athletic nights, basketball, water polo, and School At-Home, with our third year men such as Art Huycke, Al Weir, Rick Hill, etc., giving those men in fourth their expert advice, and very successfully too . . These happened to come along to

fill in time between lab reports . . . Fourth year men didn't help us very much to keep the Jenning Cup. But as this is written Philips, McReynolds, Fintch, Grierson and etc., are helping *them* towards the basketball trophy . . Muddiman and Tress are splashing around for Water Polo supremacy, "Sailor" Johnston is giving Ace Bailey help against McGill and Neil Gillespie foiling everyone with his thrust, parry point; Bill Beck, Pete Kingsmill and company are slaloming over hinterland trails helping Toronto to win Intercollegiate Ski Honour. Jack Swan dropping baskets by the Dozen for "Moose" and his blue squad. Keith Conn kept up his fencing reputation. Bill Dimma and John Mills are talking their heads off about debatable subjects and many thousands of others worth mention and praise are making the class of 4T8 famous, as the producers of champions and Great *Men.*

Elections came and went and a very capable man takes over 4T8, Chris Miller is his name and knowing him as I do, I know he will not be found wanting and will give all his efforts to making our final year best yet . . So here's hoping, Chris, that all those swell fellows who did all the work for me will be around to keep the Spirit of Fourty-Eight alive and flourishing. To all you five hundred members of our aforementioned "Collective Eye." I'd like to offer my thanks for giving me such swell co-operation and the very best of luck in your exams, because if you are anything like I am, you'll be cramming like hell from here on in. . . .

W. A. MacDonald

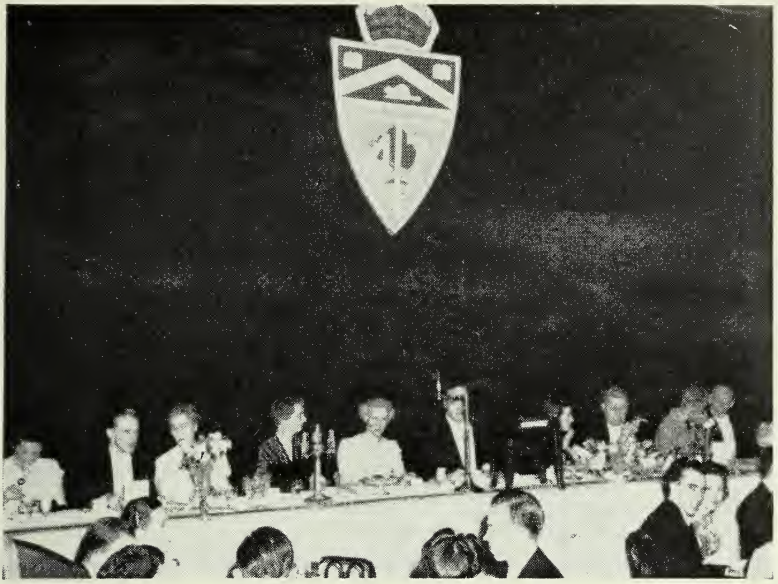
GRAD BALL

The Dance Floor

The grads of 4T7 and their ladies dined in candle-lit splendour at the long-awaited Grad Ball on Friday, March 7th, in the Concert Hall at the Royal York Hotel. This was a formal dance, and the first formal Skule function held by the class of 4T7.

The chef came forth with an excellent menu highlighted by roast capon and all the trimmings. The toasts to the University and the Faculty were ably responded to in short farewell addresses by President Smith and by Dean Young. Bill Daniel, our President, presented the gold keys to those who had served on the Engineering Society Executive. Prof. Wright, Director of Studies at Ajax, awarded leather medals to those students who had distinguished themselves in school's service.

From nine'til two the class enjoyed the music of Bob Gimby and his orchestra in the Crystal Ballroom. At intermission there was a lively sing-song during which many of the favorite engineering songs were sung with the usual gusto.



An unusual feature of this dance was the programme. It caused much comment and will provide a valuable momento of the occasion.

The committee is to be congratulated on a successful finale to the social functions of a great year—4T7.

THE VARSITY CHRISTIAN FELLOWSHIP ENGINEERING BRANCH

IT IS NOW FIVE YEARS SINCE THE ENGINEERING BRANCH OF THE Varsity Christian Fellowship began on the campus and has once again proved its worth as a source of spiritual strength and stability to many fellows in Engineering.

During the past year the meetings of the Fellowship have been of two types, one for Bible study and discussion groups, the other more specifically evangelical. A series of meetings was held in the Fall term to set out God's good news in Jesus Christ. Different types of speakers have been present but they all tell the same message,—that Jesus Christ, God's Son is the answer to all man's problems in life, and that a personal faith in Him brings forgiveness of sin and gives point and purpose to life.

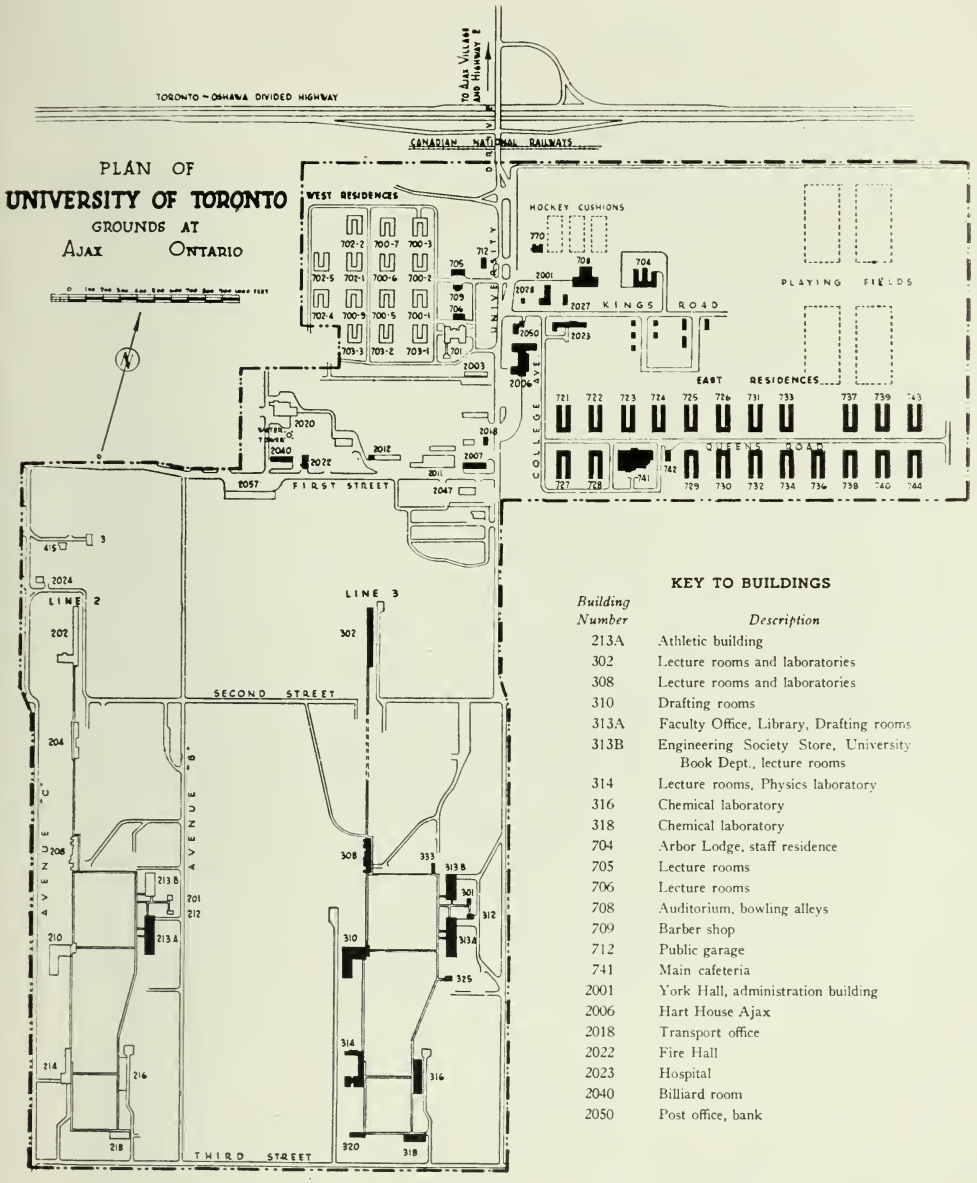
The Engineering Branch is an integral part of the V.C.F. on the campus and has its full share in the general activities such as a Bible lecture course, firesides, hikes, conferences and the International Convention during the Christmas vacation.

Any and all undergraduates and members of the faculty are extended a warm invitation to any or all of the general Fellowship meetings and particularly to those of the S.P.S. group.

The executive for the year 1946-47 was:

Past President	*President*	*Secretary-Treasurer*
N. R. BUCHANAN	J. D. HISEY	P. WIEGAND
Membership		*Publicity*
D. WHITFIELD		W. RATZ

J. D. HISEY



KEY TO BUILDINGS

Building Number	*Description*
213A	Athletic building
302	Lecture rooms and laboratories
308	Lecture rooms and laboratories
310	Drafting rooms
313A	Faculty Office, Library, Drafting rooms
313B	Engineering Society Store, University Book Dept., lecture rooms
314	Lecture rooms, Physics laboratory
316	Chemical laboratory
318	Chemical laboratory
704	Arbor Lodge, staff residence
705	Lecture rooms
706	Lecture rooms
708	Auditorium, bowling alleys
709	Barber shop
712	Public garage
741	Main cafeteria
2001	York Hall, administration building
2006	Hart House Ajax
2018	Transport office
2022	Fire Hall
2023	Hospital
2040	Billiard room
2050	Post office, bank

JUNIOR SCHOOL AT AJAX

January 1946 to ?

CONCEALED BENEATH THE COLD AUSTERITY OF THE BUILDINGS and pipe lines that make the first impression on the visitor to Ajax, a typical university community lives a normal, enthusiastic university life, replete in all its customary aspects. Besides the usual academic work, there are sports, movies, music, sketching, photography, meetings of student societies and clubs—all those activities that provide recreation so necessary for a full, happy and healthy life. It may interest you to read something about the extra-curricular life of Junior School at Ajax.

Consistent with the principle that the School should remain one and undivided even though twenty-five miles separate the Third and Fourth Years from the First and Second Years, the Engineering Society laid its plans to operate, during the life of Ajax, as a society with two branches, one to be called the Toronto Branch and the other the Ajax Branch, each with its own executive, but having over all an Engineering Society Council that would be responsible for formulating the general policy and program of the Society. Plans were also made to enable the constituent clubs of the Society to carry out their usual function at Ajax. In accordance with these plans, meetings, dances, dinners are held just as they have been for years at Toronto. The Ajax Branch of the Engineering Society has also cooperated with the Engineering Institute of Canada and the professional societies to hold many useful meetings and conferences.

The School Athletic Association operates on a plan similar to that of the Engineering Society and assists in providing opportunities for sports of many kinds. The University Athletic Association, too, has extended its facilities to Ajax and maintains an athletic office and instructional staff like that in Hart House, Toronto; and provides, as in Toronto, playing grounds, rinks, a bowling alley, gymnasium, tennis courts, an outdoor track, and horseshoe pitches. As a result, Junior School, often playing under the name of Ajax, has competed with success in all the intra-mural sports of the University. Indeed, Junior School won the intra-mural Soccer, Hockey and Basketball, the Junior Harrier, the Junior Track and Field, the Senior Boxing Championships,

and has been a keen competitor in all competitions. Junior School, also, entered a team in the Junior O.R.F.U. and was only defeated in the finals by a very strong team from Assumption College, Windsor, in a stubbornly fought game. With most students living in residence, a keen rivalry characterizes a series of inter-residence competitions in bowling, hockey, basketball, volleyball, soccer, tennis, golf, track and field, with a total of three hundred and seventy teams in competition.

Junior School has a Glee Club, an orchestra and brass band, all providing interesting recreation for their members. An excellent record player and many of the best records have been made available in Hart House Ajax to those interested in this kind of music. Several gifted pianists and musical organizations have been good enough to come to Ajax and perform to the delight of many residents. Music, it can be seen, is being heard and enjoyed on many occasions. The Music Room in Hart House Ajax, a beautiful room with a grand piano, supplies an artistic setting that contributes much to the pleasure of the many musical performances.

Those who enjoy reading are able to find, in Hart House Ajax and in the non-technical library, a novel or play, or some history, or philosophy with which to spend a pleasant hour. A Model Club, supplied with a drill press, jigsaw, lathe and other tools, has built some splendid model aircraft that have been very successful in competition. In the Radio Club, which is equipped with a five-hundred-watt transmitter and a good receiver, the amateur radio enthusiasts have built many sets and have done intensive code practise. Other students have found entertainment in the Drama Club and worked up this past session an unusually good performance of the play "Smiling Through." Altogether there is perhaps more activity of this type than at Toronto.

Because of the location of Ajax, about three quarters of the students live in residence, something that has not happened before in the history of the School and which has a decided effect on the whole atmosphere. It is in this one respect that there is any marked difference between Ajax and the Toronto Campus.

W. J. T. Wright

UNIVERSITY OF TORONTO AJAX DIVISION

LONG BEFORE THE END OF THE SPECIAL FIRST YEAR SESSION IN August 1946, plans were being made to accommodate both first and second years at Ajax for the regular 1946-47 session. The total anticipated registration was 2800, double that of the previous special session, but the actual number of students exceeded 3,200. This relatively large number taxed most of the facilities to the utmost.

Three major construction projects and numerous additions and alterations to buildings were completed before the beginning of the term in September. The largest of these projects was the necessary alteration to buildings in former production line 2 to provide additional lecture rooms and laboratories similar to those in line 3. The Cafeteria was enlarged to increase the seating accommodation from approximately 700 to 1,040, and the residence buildings in the Western Area were renovated and refurnished to conform to the standard of those in the Eastern Area.

During the early days of the first term, the heavy task of registration and the actual admission of students into residence was carried out in a most able manner by all the staff concerned. 2,300 students filled the 32 residence buildings almost to capacity and it is interesting to note that there are students from every province in Canada and from the following countries; England, Scotland, France, Norway, Poland, Greece, Egypt, China, Argentina, Brazil, British Guiana, Chile, Columbia, Equador, Peru, Venezuela, Gautemala, Dominican Republic, Mexico, Bermuda, Cuba, British West Indies and the United States. Perhaps the most outstanding feature of residence life was the development of student government through the 32 House Committees.

The greatest strain was placed on the facilities of the Cafeteria where it was necessary to serve approximately 7,000 meals daily.

Although community life in the Ajax Division was developed to a high degree in the first session, the large increase in the number of students in residence placed a heavier load on those responsible for the recreational, athletic, social and religious life of the students.

Hart House, Ajax, has played a full part in promoting those important activities that have become traditional with Hart House in Toronto. Music Recitals, Art Exhibitions, Drama performances

have all been of a high standard. The Record Room is in use many hours every day and great appreciation has been shown by the use of the splendid collection of classical records. The Browsing Library has continued to draw many students who enjoy the casual book. Much interest and enthusiasm has been shown in the Camera Club, Glee Club, Drama Club, Model Club, Chess Club and Amateur Radio Club. Moving pictures have been shown every week; dances have been arranged and bowling has always been popular with students and staff alike. In these and many other ways Hart House, Ajax, continues to make an important contribution to the student community life at Ajax. The rooms of Hart House, Ajax, particularly the Tuck Shop were crowded every day especially during the noon hour and the evenings. Real service has also been given through the operation of shops for barbering, cleaning and pressing and shoe repairing.

Sunday and week-day Services were conducted in the Chapel by the Rev. Carl Swan. These Services and the personal work of Mr. Swan are a vital factor in the life of the students at Ajax.

A very extensive programme of athletics and recreation was conducted both in inter-faculty and inter-residence competition. In the interfaculty series, Ajax was successful in winning the Soccer Championship, the Junior Harrier, the Junior Track and Field, and the Open Ski Meet. The Eastern Ontario Championship in the Junior O.R.F.U. League was won by the Ajax Rugby Team. Of the students in residence, 80 to 90% participate in the inter-residence sports programme which includes bowling, hockey, basketball, volleyball, track and field, golf, soccer and tennis and there is keen competition between the 372 teams. At the opening of the spring term, an additional building was made available for gymnastics, boxing, wrestling and tumbling. Great encouragement has been given to the inter-residence athletic programme by the donation of trophies for almost every sport. These include the Sidney Earle Smith Cup, the Dean C. R. Young Pennant, the J. Roy Gilley Trophy and the H. V. Hearst Trophy which were presented in 1946. During the present session, the Chancellor, Dr. H. J. Cody presented a Cup for soccer competition; the Class of '17 Applied Science and Engineering presented the Robert A. Barbour Memorial Trophy for basketball and the Class of '21 Applied Science and Engineering donated a Memorial Trophy for competition in Hockey.

Towards the end of the first session at Ajax, a more suitable

building was provided for the Circulating Library. The Library is open from 9 a.m. to 10 p.m. and is used extensively by both resident and commuting students for study and recreational reading. Attractive and quiet study rooms are located on the second floor.

The University Health Service at Ajax has had a particularly busy year due to the large enrolment. In addition to the regular physical examination of all students, the Health Service has been responsible for the well-being of the 2,300 students in residence. In the hospital during the month of November, 1,093 patients were seen in the out-patients department and 21 patients were admitted for a total of 56 hospital days.

The Student's Administrative Council has had a very active year in the operation of the Employment Service, the Housing Service and in the administering of a loan fund. In addition, the Students Administrative Council appointed the Varsity Staff and sponsored the Ajax Band, a dance orchestra and is responsible for the sale of Gray Coach bus tickets.

The many administrative problems created by the enlarged enrolment were faced with a genuine spirit of co-operative effort by all members of the staff of the Ajax Division.

J. R. Gilley

PRESIDENT'S MESSAGE

As the period of abnormal expansion for the University of Toronto comes to an end, one finds a new Campus, one half the size of the original, firmly established at Ajax. "School" has borne the major burden of this upheaval, and to-day has difficulty in realizing that it has not always been this large. Without a doubt, this year ends one of the most successful periods in the long and colourful history of S.P.S. and the Engineering Society. As for myself, I am deeply grateful for the small part that I have been permitted to play, during this critical period, in the growth of the Society.

Owing to the size of the Freshman year, and the average age of those coming in, it was wisely decided not to adhere to the traditional Reception Programme. Instead the new "Schoolmen" were introduced to "School" spirit by Gord Beatty and Mr. Ross Workman in the Recreation Hall at Ajax the day following registration. This type of initiation has proven to be very successful. The annual Freshman dance was held in the Royal York Hotel on October 23, and the four hundred Freshmen received the programme Gord Beatty had arranged for them, with traditional Engineering Spirit.

Owing to the fact that the first session at Ajax did not finish until August, the Annual elections at Ajax were not held until October. While this meant that the first year students were able to vote, the experience gained definitely proved that the spring is the logical time to elect the new executive. As the major burden of the initial rush fell on last year's executive, I should like to thank Mr. G. W. Beatty and Mr. E. C. Hodgson for the large part that they played in the initial organization of the social programme and the store. It is noteworthy that one week was sufficient to enable all students to purchase their requirements in the store. We are also indebted to Professor Wardell for his co-operation during this very trying period.

The School Dinner, which was held, after much difficulty, at Ajax, School Night and the School-At-Home were all run as joint functions. I hope that this practice will continue, and that these major "School" events will remain the highlights of the University social calendar. The Engineer's Ball, a glorified name for the Soph-Frosh, saw twelve hundred couples crowding the Convention

floor of the Royal York Hotel. The efforts of Phil Kevill, Ernie Banks and Harold Blakely meant that the Engineers' Ball could be classified with the School At-Home and other major Campus social events.

Al Chapman, the second Vice-President has devoted a tremendous amount of energy to both stores at Ajax. It was decided last year that a branch store would be required, so that the Engineering Society had two permanent stores in operation in September, in addition to two temporary stores that were used for the first week. The whole student body at Ajax owe Messrs. Chapman and Hodgson much for the expeditious manner with which they have managed the Supply Department.

The Clubs were formed at Ajax this year and so the Engineering Society here is an exact duplicate of the Society at Queen's Park. The Club Chairmen and their executives are to be complimented on the way in which they surmounted the many obstacles that are always met, during any initial organization drive.

I would like to urge my successors to keep the welfare of the Society in their minds. Ajax is no more a branch of the Society, than it is a branch of the University. There will be times when both parts of the society will be tempted to take a selfish and short range view of some particular item of business. If you will remember that there is always an explanation for everything, and that co-operation is the pass-word between Queens Park and Ajax, then you do not need to hold any fears for the future.

Bill Daniel and his executive are to be complimented on the manner in which they have worked with us this year. If there is a job to be done, do not worry who does it, or who gets credit for it, but make sure that the work is completed as quickly as possible. And so I say to my successor and those who will follow you, Sir: "Put the well-being of the Society above any personal, factional, or selfish interests, and you will find that you will enjoy a successful term of office."

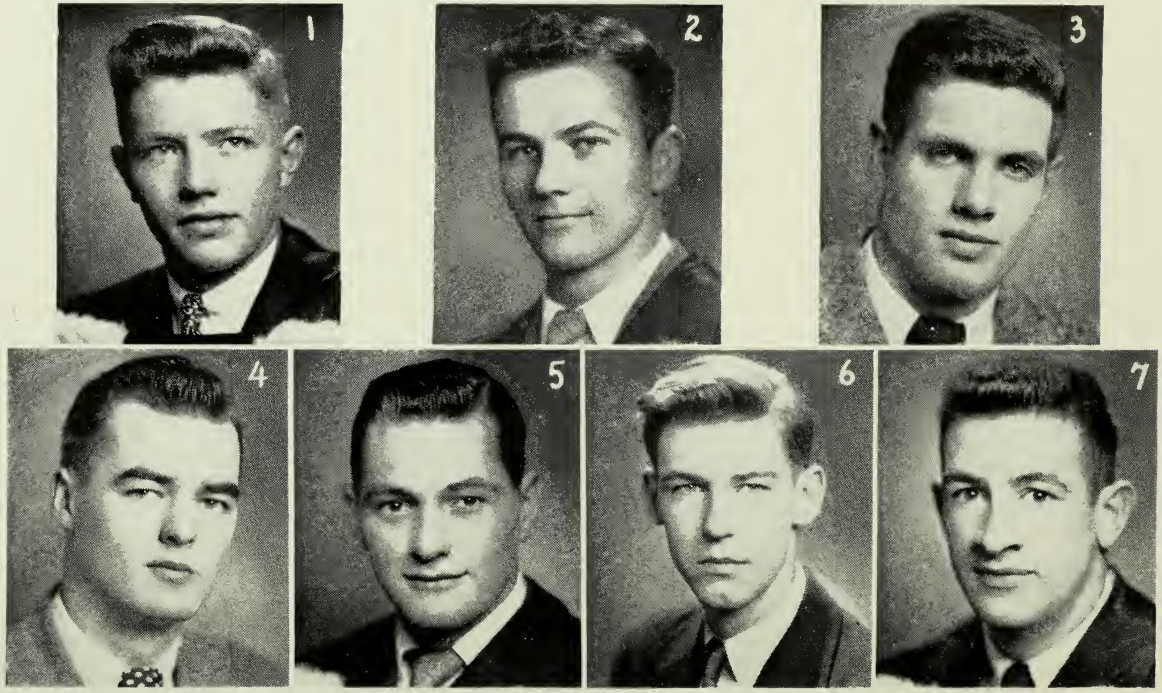
In conclusion I wish to leave with you two lines from Browning —perhaps this can become our motto—perhaps the motto of civilization:

"He who builds the church to God and not to fame,
Never marks the marble with his name."

M. J. McAuliffe.

SCHOOL ATHLETICS
1947

ENGINEERING SOCIETY
THE UNIVERSITY OF TORONTO



ATHLETIC EXECUTIVE

K. C. Hendrick; C. W. Daniel; W. J. McCann; W. H. Nord; L. K. Farquhar; J. A. Swan; T. L. Hennessy.

S.P.S. ATHLETIC ASSOCIATION

THE EQUIPMENT'S PACKED, THE LINIMENT PUT AWAY AND another year of sports is drawing to a close. It has not been the greatest year in sport for School in records of championships won but that intangible items of fight, spirit and teamwork never were produced in greater quantities by the lads in Blue and Gold. The "mighty ones" in Hart House have been promising a re-allocation of points, so perhaps the big T. A. Reed Trophy will again rest in its proper niche in S.P.S.

This year was the second in post war Intercollegiate competition and we would like to extend our congratulations to the fellows who so ably represented S.P.S. on the big Blue Teams.

The Athletic Association has attempted to provide opportunities for every Schoolman to participate in some form of athletics and this year we have established a new point system to encourage this participation. We hope we have been successful.

To the past executive, managers and teams we would like to say "Thanks" for a swell effort, it couldn't have been better.

To the new organization we wish every success. The future is always indefinite but one thing is certain, the Skule spirit and fight will never be lacking.

Best of luck, Jack.

K. C. HENDRICK

BRONZE "S"

THIS YEAR THE GRADUATING CLASS OF 47 HAS AWARDED TO Keith Hendrick, School's most honoured Athletic Trophy—the Bronze "S".

For four years "Happy" has displayed his outstanding quality of leadership, athletic ability, and true sportsmanship in the many teams for which he has played.

Keith's interest in School sports has been evident since his first year. He has held the position of Vice-President, Secretary-Treasurer and finally President of the Athletic Association.

Keith's activity in sports has been surpassed by no one in the faculty. He has displayed his ability in rugby, basketball, volleyball and water polo each year at S.P.S.

On these teams he could be counted on to do his part as efficiently and thoroughly as any man on the team in both practices and games.

Keith is one of those living proofs that academic work and athletic activity will mix. An honour man each year and this year the ultimate, Keith was awarded a Rhodes Scholarship.

To Keith, School extends its heartiest congratulations and we know by your record here that your successes as an engineer in the future will be manifold.

PHENE MEMORIAL

THE PHENE MEMORIAL TROPHY, THIS YEAR WAS WON BY BERT Hamm. This cup is presented annually to the man on the Senior School Rugby team, who, in the opinion of his team mates, has displayed on the gridiron the qualities of true sportsmanship, enthusiasm and team play, to the best advantage.

One of the best athletes out of Riverdale Collegiate, Bert came to "School" and played a very prominent role in Interfaculty and Intercollegiate sports. Although an outstanding athlete in Basketball, Volleyball, Hockey and track, Bert will always be remembered for his stellar performances on the football field as quarter back and captain of another great Sr. School football team. Best of luck, Bert.

SCHOOL II — LACROSSE

THIS WRITE-UP LIKE MANY OF THE OTHERS IN THIS YEAR'S LIST has rather a sad theme, it looked as though "the powers that be" were tired of seeing School win.

The seconds this year were pitted against U.C. II, Meds II, and St. Mikes I, a formidable list. In this tough company the boys weren't able to eke out a win in any of the six scheduled games. They must be admired for their never-say-die-attitude which made most of their exhibitions real contests.

The boys all had a lot of fun and gained some valuable experience that will go a long way towards bringing the silverware back to School next year.

On the club this year were: Bob Beech, Jim Ellwood, Pete Fellows, Gord Ferrier, Don Francis, Bob Love, Herb Monteith, Scott, Al Sentance, Ed Teghtsoonian, "Stu" Williamson. Better luck next year. . .

SPIKE

SR. SCHOOL LACROSSE

THE SECOND GROUP THIS YEAR WAS THE STAMPING GROUND FOR Senior School, Senior U.C., Dentistry and Forestry. It was the scene of many a grim battle and close calls. At the end of the regular schedule our boys stood second by merit of their four wins and two losses (both to Forestry).

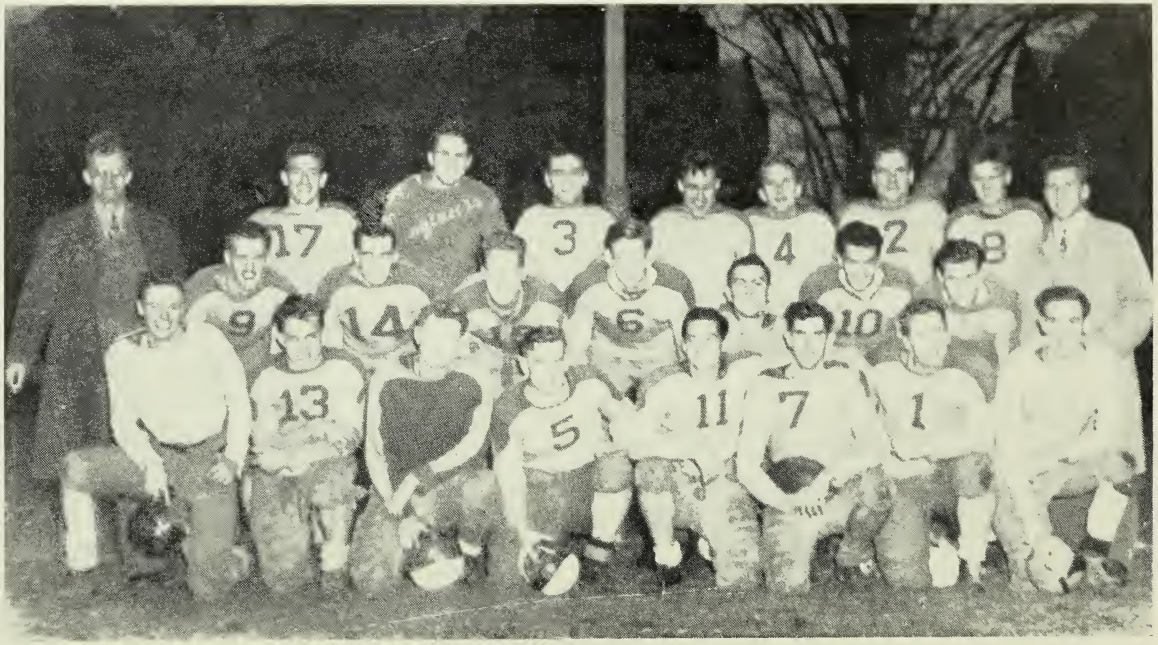
There seemed to be a jinx on the team and they had two starts before they succeeded in completing one game. In the first game of the season we met Senior Vic and eked out a meagre 11 - 10 victory only to find out after the game that it was all a mistake and that Vic was in the first group. Next, a game was scheduled with U.C. and once more the boys started off with flying colours only to have the game called early in the second half because the lights went out. Needless to say, the schedule was finally completed.

In the quarter finals Forestry II fell easy prey to our boys, they absorbed a 21 - 5 trouncing. But then came the semi-finals with P.H.E. I and the end of the road for Senior School. The score was something like 22 - 7.

The team this year consisted of: Bill Daniel, Max Davey, Duke Glenn, Ralph Howard, Hank Jannaway, Pat McDonough, Bill Moorehead, Bob Smith, Roy Tredgett, Al Venchiarutti.

Yours truly,

SPIKE



S. P. S. SR. FOOTBALL

Top Row: C. W. Eggert; T. L. Hennesy; D. H. Storey; R. N. Saba; R. F. Seymour; E. G. Odette; H. F. Bartram; W. Thompson; H. C. Ballou.

Middle Row: J. G. Plunket; W. H. Nord; F. Godfrey; W. A. MacDonald; H. P. Koehler; B. W. Gilbert; S. Jacobs.

Bottom Row: J. P. S. Roberts; K. R. McClymont; D. H. Francis; S. S. Wies; L. R. Farquhar; H. J. Hamm; L. Butko; K. H. Sharpe.

SENIOR SCHOOL RUGBY

THE 1946 RUGBY PICTURE SAW SR. SCHOOL BEATEN OUT BY THEIR traditional rivals—Sr. Meds.

School had a strong team with many stars back from last years Champion Team.

The opening game saw School lose to a new team from P.H.E. by a 5–0 score. The game was poorly refereed and the scoring protested.

The tackling of Farquhar and kicking of Seymour were outstanding in the backfield while Godfrey, Conn and Gilbert were best along the line.

The second game saw Herb Coons outrun the entire St. Mikes team on two occasions for major scores while Bert Hamms spectacular broken field run and Ken Sharpes specialty, the Blocked kick, also counted majors. The final score was 19–0. Plunkett and Weir also played well in the backfield.

The Blue and Gold lost the next two games to Sr. Meds, 14–3 and 8–0. Red Weir's field goal was the only score school obtained. The line play was very good with Bartram, Sharpe, Storey, Butko and McClymont showing great team work.

School got sweet revenge from P.H.E. by a 12–0 score. A 30 yard plunge by Weir and a fumble picked up by Don Francis converted by Bert Hamm completed the scoring.

In the last game, Bert Hamm led the way with a field goal in the 3–1 win. Pete Roberts and Spike Hennessy were outstanding at end making many hard tackles.

That wound up the season, the final count School won 3, lost 3.

Carl Eggert IV Mining and Metallurgy was the master mind of the team and did a marvelous job of guiding the boys.

All we need to ease our souls is the Mulock Cup next year so lets do it!

H. C. BALLOU,

SR. S.P.S. SOCCER

L. Murray; D. C. Henshaw; T. Hayman; J. Robinson; R. Morrison.
Seated: B. Stoicheff; W. Macke; R. Butterworth; D. H. Staples; W. Pidlubny.

SR. S.P.S. SOCCER

As soon as the boys arrived back at school after their summer's labor, the soccer players sized up the available material, whipped out their slide rules and figured that School had a championship team in the making.

In the first game against Ajax it looked as if their calculations were not far wrong, for after a dazzling four chukkers of play, Ajax wound up on the low end of a two—nothing score.

After this auspicious beginning the boys couldn't be held back. Out-played and out-guessed, both Meds and Dents fell ignominiously before the onslaught of the school eleven, for both games resulted in shut-outs for the school team.

At the end of the schedule they were at the top of their group and with their unique combination of scoring punch and defensive play they seemed a cinch for the championship.

the But fickle fate that governs sport decreed otherwise. Emms, the stalwart goal-keeper, who had never allowed a single tally against him was unable to play in the finals—owing to his absence the Foresters were able to pile up a commanding lead and take the game, ending all championship hopes of the school squad.

Murray and Emms were undoubtedly the outstanding men on the squad. Murray's sure-footed rushing, fine defensive play and his dead-eye shooting led the team to many a victory. McNair on the forward line often added that extra punch that led to a score. Hayman, Robinson and Stoicheff also deserve mention for playing that often approached brilliance.

Henshaw, Morrison, Macke, Butterworth, Staples, and Pidlubny provided that sound basis of team play without which individual brilliance counts for nothing.

All in all it was a great year, championship or no.

Next year with new blood coming in from Ajax perhaps School will again take possession of the coveted Arts Faculty Cup.

B. Pidlubney

S.P.S. I HOCKEY

Top Row L. to R.: R. D. Mosher; R. Fortin; D. C. Haldenby; J. Haines; J. Ratcliffe; (Manager)
D. V. Roland; E. Krysanowski. (Coach)

Bottom Row: F. A. Huycke; M. Sabiston; P. McDonough; D. Saunders; G. R. Muddiman; P. Wilkes.

S.P.S. I HOCKEY

THIS IS THE YEAR THAT THE PROVERBIAL WORM HAS TURNED. After sitting right atop the interfaculty hockey set-up for two years, the hockey fortunes of S.P.S. I sank to an all-time low this year when the team failed to win a single league game. It would be wrong to say that we were out-lucked in all or any of the games. To state that we were in the same group as two of the finest intramural teams at the University would be to pay a well-deserved compliment.

Numbered among our players were: goal, Don Saunders; defence, Art Huycke, Bob Muddiman, John Ratcliffe, Dave Roland; forwards, Russ Fortin, John Haines, Doug Haldenby, Pat McDonough, Mac Sabiston, Pete Wilkes.

This season was a total loss but with a lot of strong hockey players due to arrive from Ajax, next year S.P.S. should regain her place of prominence in Campus hockey.

RALPH MOSHER,

S.P.S. II HOCKEY

R. D. Morrison; D. H. Staples; R. F. Seymour; W. Tranmer; W. MacDonald; W. Clarkson; R. Freeman.
A. P. Sentence; S. Waddell; C. Miall; R. Mosher; S. W. Forstrom.

S.P.S. II HOCKEY

SCHOOL SECONDS WEREN'T WORLD BEATERS THIS YEAR BUT THEN School has been hogging the trophies too long anyway. The boys worked at the practises and gave their best at the games but it wasn't enough to win. The games were close—usually decided in the dying minutes and the brand of hockey was rugged—as only intramural hockey can be rugged.

Sid Forstrom and Bill Tranmer showed an aptitude for blinking the little—but oh so important!—red lights.

Cliff Miall in goal was blessed with trio of bouncing boys in front of him personified in the earthly shapes of Bob Seymour, and Bob Morrison, and the unearthly shape of Bill MacDonald.

Remember that game we dropped to St. Mikes after blowing a 3—0 lead. Never mind fellows—read the St. Mikes Year Book and you'll find it was because of their inspired play so it's not your fault. St. Mikes won the championship after all—sob!

We always have something to look forward too though—Ajax is coming next year. We hope the fourth year boys are back with us too—what a team we'd have.

S.P.S. III HOCKEY

Back Row: A. Sentence; J. Bull; G. Johnston; H. J. Hamm; R. Ball; C. Miller;
Mgr. R.W. C. L.W. D. R.W.
W. R. Stepknowski; T. A. Ewing.
D. D.

Front Row: R. Galpin; D. Crighton; H. Shugg; H. Hall; W. Nord; Betty Balfour.
L.W. D. Goal C. R.W. (Mascot)

S.P.S. III HOCKEY TEAM

NO ONE CAN SAY YOU DIDN'T TRY, FELLAS—

The past hockey season has proven once more to be a typical "School III" year. One win and five losses the score board painted out as the schedule closed, but, had points been awarded for "near misses," here's one team that really deserved a million! They were close all the way with lady luck failing in her usual last minute, leaving a fighting twelve at the tail end, after many a first period scoring streak.

For the "Game is the Thing" column, the season was the best, as every man on the squad gave up spare time and the "odd" lecture or lab period to turn out for practises and games. As a result a fine spirit of co-operation and team-work developed, which, falling short of driving the boys to victory, provided a lot of good "clean" sport.

"Condition," the inevitable enemy of all School teams, reared its head on numerous occasions and just wouldn't fade even with every man playing good hockey from start to finish. If in the next season, facilities are available for championship teams to develop as they should these boys will be right in there fighting, as they have been this year.

AL SENTANCE,

S.P.S. IV HOCKEY

Back Row: J. Robbins; R. Butterworth; D. Francis; P. Phillip; R. Morrison.
Front Row: R. Fryer; R. G. Tredgett; J. Phelan; W. McCann; R. W. Waechter; H. Ballou.

SCHOOL IV HOCKEY

This team was composed largely of the late appearing talent that missed the first couple of practices. After a discouraging start the boys started to move and looked a group winner late in the schedule. However a short talk with Dean Young and the new blonde in the library convinced them that a Jenning's Cup tussle would only tire them for the exams so they bowed out good naturedly.

The line up was as follows: Forwards: "Greek" Phillips. "Sleeper" Butterworth, Bob Fryer, Red Waechter, Jackie Phelan, Roy Tredgett, Red Williamson, Pete Fellowes, and Ken Baker Defence: Bill McCann, Jacke Robbins, Don Francis and Hank Ballou. The Cage was guarded by capable perennial Jimmy Robinson.

When asked where the blame lay club philosopher "Lib' Aristotle" Fryer was heard to say "We wuz outcoached."

R. D. Morrison,

I BASKETBALL

Back Row: D. McLaren; K. C. Hendrick; S. W. Robertson; R. J. Tredgett; J. Grierson.
Front Row: C. Fitch; B. Hallawell; L. Farquhar; T. L. Hennessy.

SENIOR SCHOOL BASKETBALL

This year the senior boys from "skule" were in the second major group where they displayed their techniques against Senior Meds, Junior Vic and Junior U.C. Even from the beginning of the season they were favorites for the finals, but were careless enough to come out with two tie scores. One of these was with U.C. and the other with Senior Meds.

Outside of these two close calls the boys played very well and managed to win the remaining four league games by decisive scores.

The system used by the seniors was the same fast break that brought the silverware to the little red schoolhouse last year. With this as an offense, and a stiff fore-checking defense, the team managed to tie their opponents up several times each game.

In the first game of the play-offs School met U.C. III who were no match at all for the Group II winners. By virtue of this win we entered the semi-finals with P.H.E. I. It was in this historical event that Senior S.P.S. lost their first game in two years and also their first in twenty-five games. When the final whistle went the score read P.H.E. 51, S.P.S. 44. Enough said!

The team this year consisted of: Lorne Farquhar, Bud Fitch, Jim Grierson, Jasper Hallawell, Keith Hendrick, Don McLaren, Jack McReynolds, Paul Phillips, Roy Tredgett.

Spike

S.P.S. II BASKETBALL

Standing: W. Pidlubny; R. Howard; A. MacLaren; V. Harrison.
Kneeling: E. Teghtsoonian; L. R. Farquhar; H. Rootham.

S.P.S. II BASKETBALL

THE SECONDS THIS YEAR WENT THROUGH A MOST UNEVENTFUL season dropping their first four games; then all of a sudden they came to life trouncing Trinity A and Sr. 4C in short order. Two things I am sure the boys learned this year were: (1) how not to break a zone defence and (2) what lack of conditioning means in basketball. These 2 factors came to a head in the return match with Ajax B at Ajax. With only one substitute the boys suffered a—should I mention it?—a 49 to 6 drubbing!

Their favorite song "Take Me Off Coach, I'm All Done" was sung in every game, but nevertheless the fellows gave their all and got plenty of exercise.

Here's the line up.

Ralph Howard—captain and centre of the team who played steady ball all season, and displayed a memorable feat of holding Rod Turner scoreless for ¾ of a game.

Vic Harrison—scored many an important basket and turned in plenty of good defensive work.

"*Hank*" *Milligan*—went wild in one game with his hook shot and scored 14 points—played good ball when he played.

Bill Moorehead—a star on the offense as well as on the defense.

Bill Pidlubney—proved his ability to score as well as check closely all through the schedule.

"*Tex*" *Teghtsoonian*—no "glory-hog" he; Ed set up many a play for his team mates and showed his fighting spirit in every game.

Ab MacLaren—his one hand shots were out of this world. Mac hooped many an important basket and would be an asset to any team.

L. R. FARQUHAR,

III BASKETBALL PHOTOGRAPHS

Back Row: C. Bate; R. White; R. F. Smith; D. Henshaw.
Front Row: J. R. Connell; H. J. Hamm; R. Graham; M. Oster.

III S.P.S. BASKETBALL

HERE ARE THE PLAYERS—BOB GRAHAM, ART HALPENNY, MAURIE O'Loughlin, Rod White, Bob Connell, Derrick Bate, Bob Smith, Murray Oster, Frank Godfrey, Dave Henshaw.

The fellows worked hard in every game, but could only squeeze in a win and a tie out of six contests. Lack of combination seemed to be the main difficulty with the boys, as they seemed to be strangers to each other at times. More practice would have helped too, 'cause fellows like Bate, Halpenny, Smith and Graham threw 'em in during the warm-up periods before games from any position; yet, during a game, would blow numerous chances just from nervousness and over-excitement.

The tie with U.C. III was really a treat to watch, with Henshaw and Oster tossing in one handers as guards O'Loughlin and Halpenny kept the ball working around the U.C. zone.

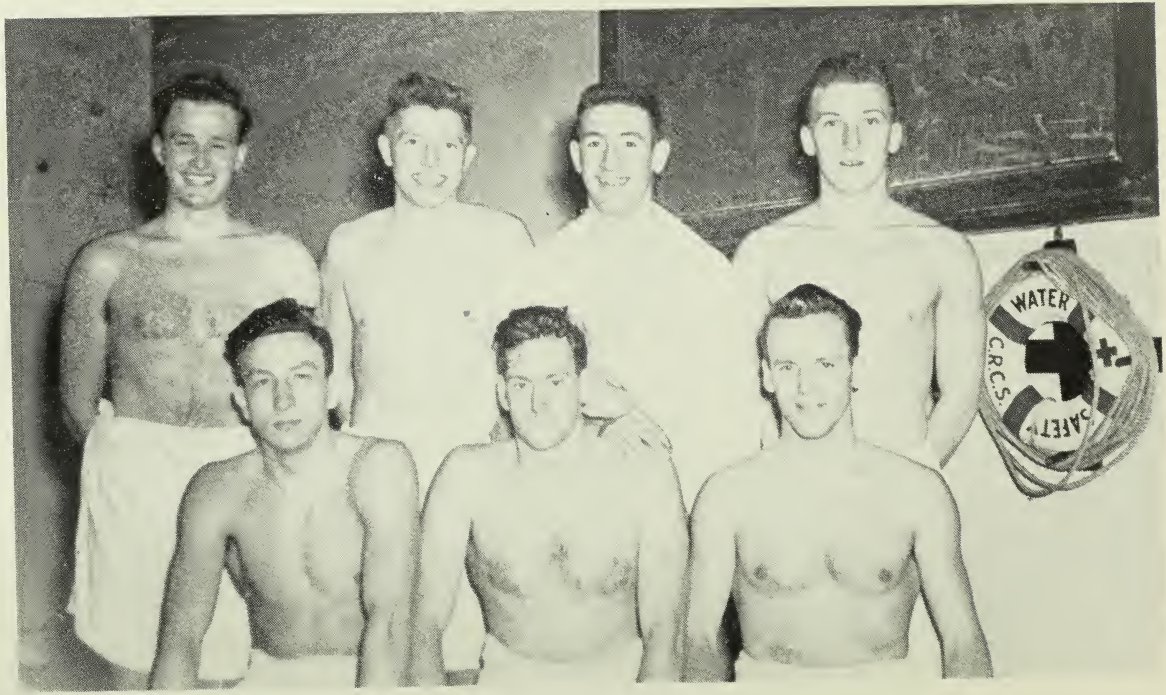
"Plunger" Godfrey threw up long set-shots in every game and managed to score a few of them too.

Connell and White provided lots of fight on the forward line, with "Get out of this game" Connell 'fighting' just a wee bit too much in one game.

One of the 'lower' spots of the season was the game against Dents B when this manager was also the referee of the contest, due to conditions beyond his control. It was an unfortunate incident 'cause the team absorbed the worst beating of the season while the referee absorbed plenty of insults from the Dents' supporters.

I think the fellows enjoyed their basketball though, and they all showed plenty of fight through-out the season. Since most of the fellows are in third year, they will provide useful replacements next winter for the Senior School team in the race for the Sifton Cup.

BERT HAMM
Manager.



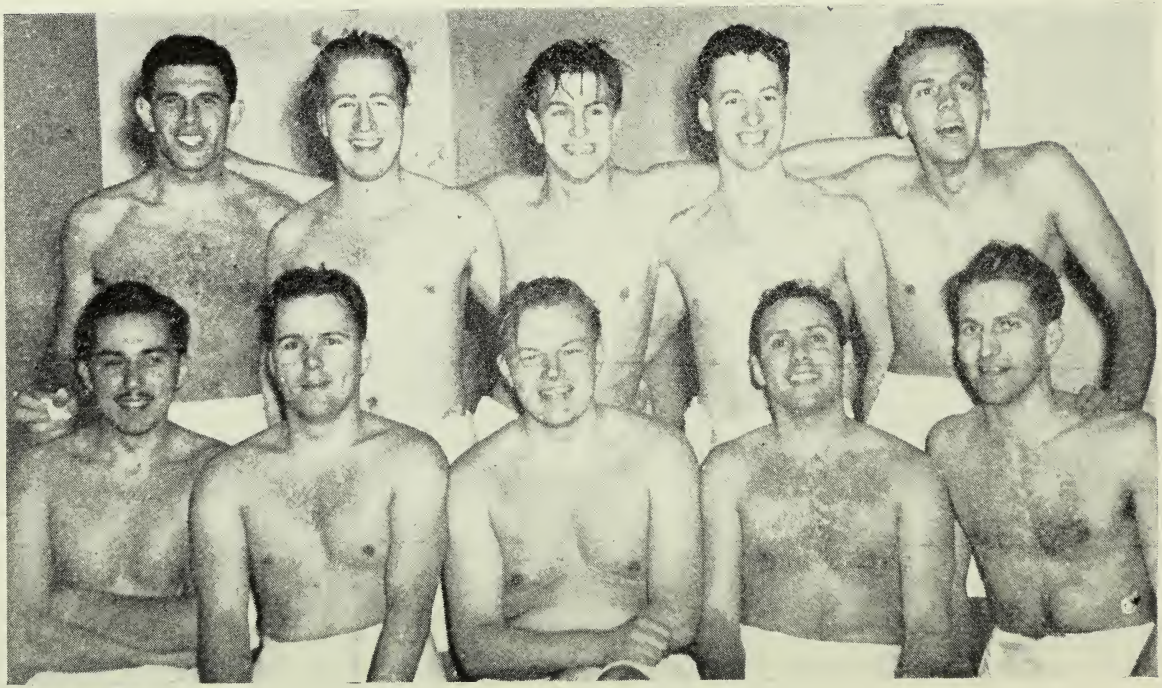
SR. WATERPOLO

Back Row: D. Fleet; K. Hendrick; T. L. Hennessy; P. Turnbull.
Front Row: R. Gray; F. Sansom; J. Graig.

SENIOR WATERPOLO

This year's team was a power packed product, with three members of the Senior Varsity team—Fred Sansom, Jim Crang and Don Fleet, and another three from the Junior Blues—Ted Granfield, Pete Turnbull and Bob Gray, all on the playing list. The other four were hold-overs from last year, Keith Hendrick, Hank Ballou, Harry Kohl and goalie Spike Hennessy. A lineup like that caused visions of the Intramural championship long before the season started, but U.C. who also had a group of Varsity players stopped us short of the trophy with an almost impossible defence. The other teams in the first group, Sr. Meds and Vic, were vanquished with ease, while U.C. II and P.H.E. barely managed to score in the playoffs, but once again in the finals we were stopped by U.C.I. Next year with six of the team returning, our chances should be even better, so at that time the other teams had better watch out!

Don Fleet



II WATERPOLO

Back Row: H. Alsberg; F. Godfrey; G. R. Muddiman; P. T. McDevitt; P. G. Tress.
Front Row: P. Tymochko; W. Payne; W. Kyro; H. Chikofsky; D. Kempthorne.

S.P.S. II WATERPOLO TEAM

THE S.P.S. II WATERPOLO TEAM EMERGED AS VICTORS OF GROUP III without being dunked once. All league fixtures were swallowed up handily by the School squad and the only team that splashed us a little was Pre Meds. But even they were drowned to the tune of 3–2 and 4–3, the first game at an Athletic night. Forestry should have brought their logs into the pool as they were waterlogged from the outset and suffered barkings of 6–1 and 7–1. The Presbyterians from Knox tasted defeat and chlorine in the pool at the hands of School.

Our hopes are high as we head into the playoffs and only time can tell how well we do.

The forward and goal scoring department was well taken care of by Messrs. Bob Muddiman, Bob Tress, Wally Kyro and Herbie Chikofsky while keeping the ball out of our end were Henry Alsberg and Bill Payne. Frank Godfrey when called upon to save was sensational but thanks to the defence the ball rarely came too near our goal. Pete Fellowes counted a few goals along with Pete Tymocko, and Don Kempthorne substituted well on defense. Pete McDevitt and Bill Dimma made up for inexperience by their enthusiasm. Bill MacDonald, whenever in town and not managing the Blues hockey team, could be counted on to get and keep the opposition wet.

All in all we had fun and next year should find us again in the win column as the Ajax reinforcements supplant our losses to the Senior team.

WALLY KYRO

I VOLLEY BALL

Front Row: J. Wilson; W. J. Jarvis; (Manager) L. Farquhar.
Back Row: B. Hamm; J. Swan; V. Harrison; R. Howard; K. Hendrick; M. O'Loughlin.

S.P.S. I VOLLEYBALL

ABOUT 50 MEN TURNED OUT FOR THE FIRST PRACTICE AND FROM them a well balanced team was chosen.

Members of the team were Vic Harrison, Jack Swan, Ralph Howard, the spikers; Macey O'Loughlin, Johnny Wilson and Keith Hendrick, the setters; Jasper Hallowell, Bert Hamm and Lorne Farquhar as versatile and capable substitutes.

The only serious opposition encountered in the groups was senior U.C. Each team beat the other in league competition, which left us tied for the group leadership.

In the playoffs, Vic were disposed of quite easily, while P.H.E. gave a better account of themselves before bowing out.

School's rivals in the finals were U.C. It was a great series with U.C. taking the first set, 3 games to 2 and School tying it up by winning three games to one.

The last set was by far the best of the season. U.C. came from behind twice to take the first two games. School won the third easily and were at game point in the fourth when U.C. again came from behind to take the cup. They are indeed worthy champions.

It was a pleasure to manage this fine team and I wish to commend them for the great fight they put up. We hope that next year the cup will rest in School's possession.

W. J. JARVIS

SCHOOL III VOLLEYBALL

Back Row: W. G. Pidlubny; W. Thompson; R. G. Tress; L. Murray; T. A. Ewing.
Centre: P. A. Fellowes; J. A. Robbins; P. Phillips; H. E. Rootham.
Front: D. Bitondo; F. J. Sansom; V. Harrison.

SCHOOL III VOLLEYBALL

SCHOOL THIRDS VOLLEYBALL TEAM WAS REALLY A FIGHTING BALL club. While they started out rather slowly losing two games at the beginning of the season, they organized rapidly thereafter. Good team spirit, plus lots of drive enabled them to win their group after extinguishing the hopes of the two other rivals in a three way tie. In the quarter finals, the team exchanged blows with the previous year's championship aggregation from U.C. and many a ball was "spiked" before the squad was edged out by a barrage of leather from a slightly more experienced team.

A "three star" selection was not possible as the "thirds" really played as a team. However such hard working stalwarts as Lance "Lace-em" Murray, "Boomer" Bitondo and "Jake" Robbins would all be candidates for such an "Oscar."

Nice try, fellows, and good luck next year.

VIC HARRISON

S.P.S. IV VOLLEYBALL

Back Row: W. H. Nord; White; R. R. Hibbard; J. A. Jagielnik.
Front Row: W. J. McCann; K. J. Kenyon; W. R. Stepkowsky; G. Shimzu.

S.P.S. II VOLLEYBALL

THE "SECONDS" WERE SLOW STARTERS THIS YEAR IN SPITE OF the herculean moral efforts of our monstrous cheering section, Lou Butko. They finished in a blaze of glory in three of six contests though—it's a long road that has no turning. Art Jackes was the squads outstanding spiker throughout the season although McEachren was nipping at his heels toward the end of the season. Throws you off form you know to have someone nipping your heels. Campbell played an excellent all round game, both setting up and spiking the ball while Mache proved his worth as a sound defensive player. Roy Butterworth, the best set-up man on the team was indispensable as he fed the ball to those lean, lanky specimens Muddiman and Granfield at the net.

All this talent however, would have been in vain had it not been for the strident battle calls of our own Lou Butko. III Volleyball last year, Lou, and II this year—why not drop the exams and come back to the firsts next year?

I'd like to thank the boys for the co-operation they've given me this year. It's a pleasure to manage a hard working outfit—win or lose.

JACK SWAN

S.P.S. FENCING

SCHOOL HAD A REALLY SHARP FENCING TEAM THIS YEAR. KEITH Conn, third year Chemical captained the boys and led them to the Intramural leadership. The competition was divided into three classes; foil,épee and sabre. H. K. Conn and G. N. Gillespie, III S.P.S. entered all three events with J. Stanborough representing Ajax in all three. J. C. Mills entered two events, épee and sabre while G. Boulanger made the trip in from Ajax for the sabre contest. The boys will all be on the Toronto campus next year (neglecting exams) so we can look forward to another School walk away. They garnered 165 points towards the T. A. Reed trophy as Conn took the intramural championship and Gillespie was runner up.

The Senior Intercollegiate fencing team included: H. K. Conn, (Capt.), G. N. Gillespie, J. Stanborough. J. C. Mills was captain of the Intermediate Team.

TRACK TEAM

THE ONCE POWERFUL SCHOOL TRACK TEAM BECAME LITTLE more than a name this year as only ten men from S.P.S. entered in the Junior and Senior Meets and the Relay Meet. Three more men from S.P.S. entered the Junior Harrier but did not place.

In the Junior Meet, Ballagh fared best with a third in the High Jump. A week later in the Senior Meet S.P.S. cornered a first and two seconds. Todd placed second in the Pole Vault and Hamm was second in the 220 yard low hurdles. Jackes won the High Jump at 6′ 1″ to break his own Interfaculty record.

In the final contest, the Relay Meet, Yeats, Ballantyne, Punnell and Dimma teamed up to win a second place in the Medley Relay.

It is hoped that with the advent of more ambitious lads from Ajax to the Schoolhouse, S.P.S. will once again be able to produce her usual Championship team.

ART JACKES

SCHOOL SKI TEAM 1946-47

THIS YEAR OUR YOUNGER AND BIGGER BROTHER RAN AWAY with the championship. But keeping it in skiers the championship will be safely held in the Faculty of Engineering for some years to come.

Ted Hill turned in a good performance and placed 2nd in Slalom and 4th in Downhill. School's only jumper, Bill Armstrong displayed beautiful style to capture 2nd. place in Jumping. The remainder of the team, Murray Jacobs, John Rankin and Jack Fleming all contributed to the points gained by the team.

Enthusiasm is a necessity for any winning combination and with a little more of this from all of School's competitive skiers, there is no doubt that Sr. School will turn out a championship team when they take to the boards next year.

HUGH CONOVER,

SR. SCHOOL SWIMMING

THERE WERE MANY CHANGES IN INTERFACULTY SWIMMING THIS year. To begin with the schedule was cut down so that School had only one team from the Campus. Also the meets were all held at odd hours, such as 1:00, 4:00 and 7:30 p.m., so that the pool would be free for Varsity practices at 5:00. A new eligibility rule was brought in this year, which barred intercollegiate swimmers from interfaculty meets. This ruling cut out many of School's best speed swimmers.

Our biggest trouble was getting enough fellows out to the noon and after-supper meets. The result? Sr. Meds were the only ones who fell to us. We had some very good swimmers who could have made the finals if they had had a little more condition and were all together at every meet.

They were:

Don Fleet—a water polo player who was nearly always good for a first in freestyle and backstroke.

Bob Gray—another water polo enthusiast who pulled in lots of points in the breast stroke races.

Harry Hall—our triple threat man could do well in breast, back, or freestyle.

Hank Ballou—another good backstroker.

Jack Mansell, Johnny Hrutka, George Martin, Craig Cringan, and Bob Sachs, did the relays and some of the freestyle.

BOB SACHS,

AUTOGRAPHS

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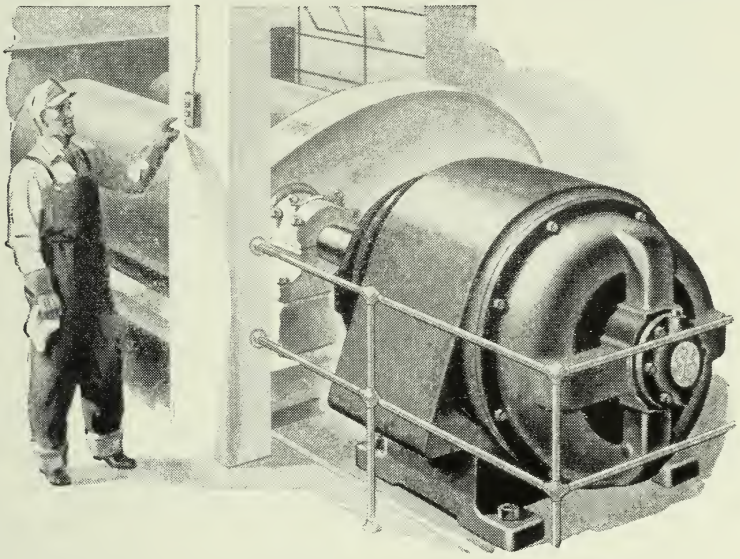

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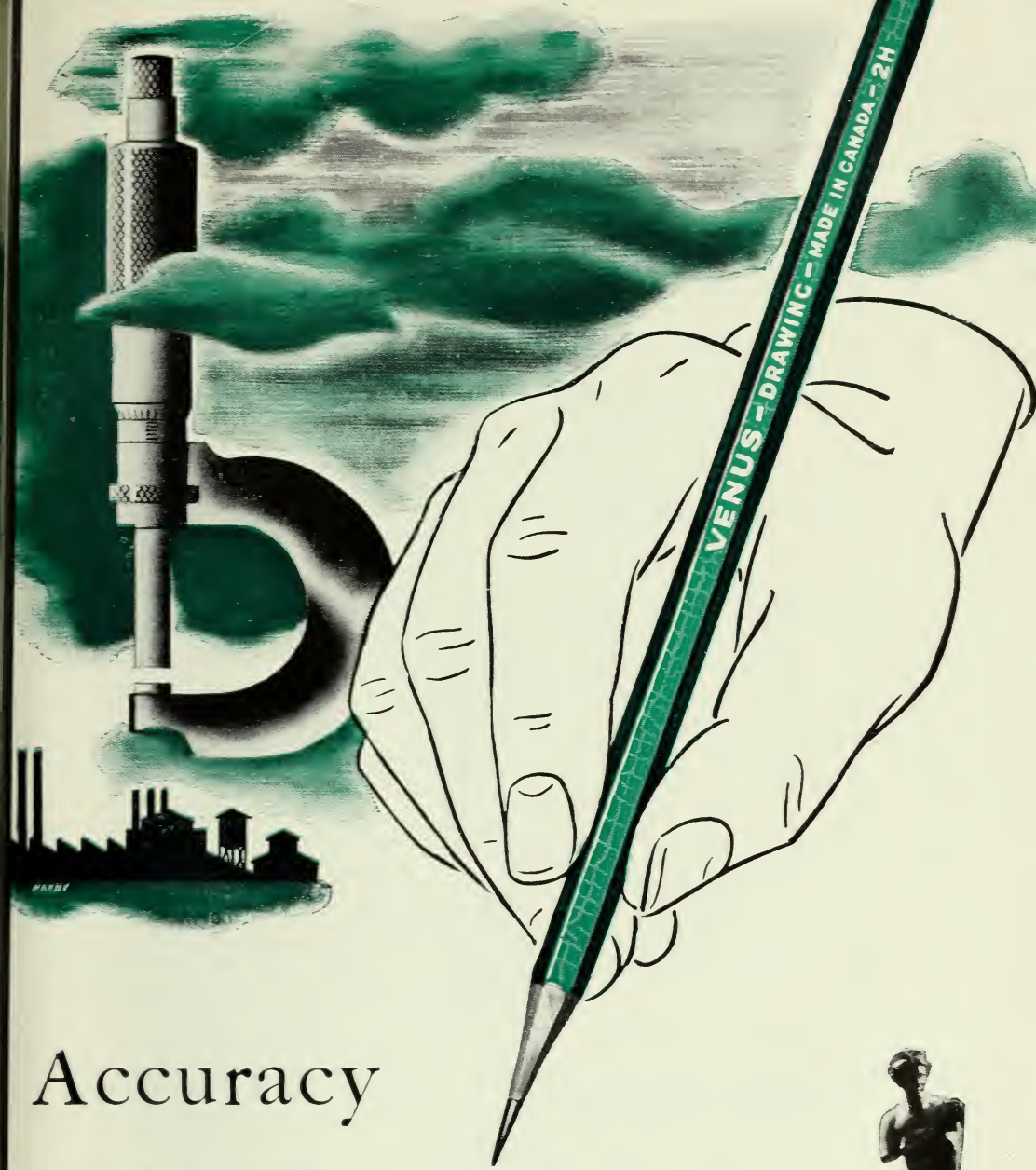

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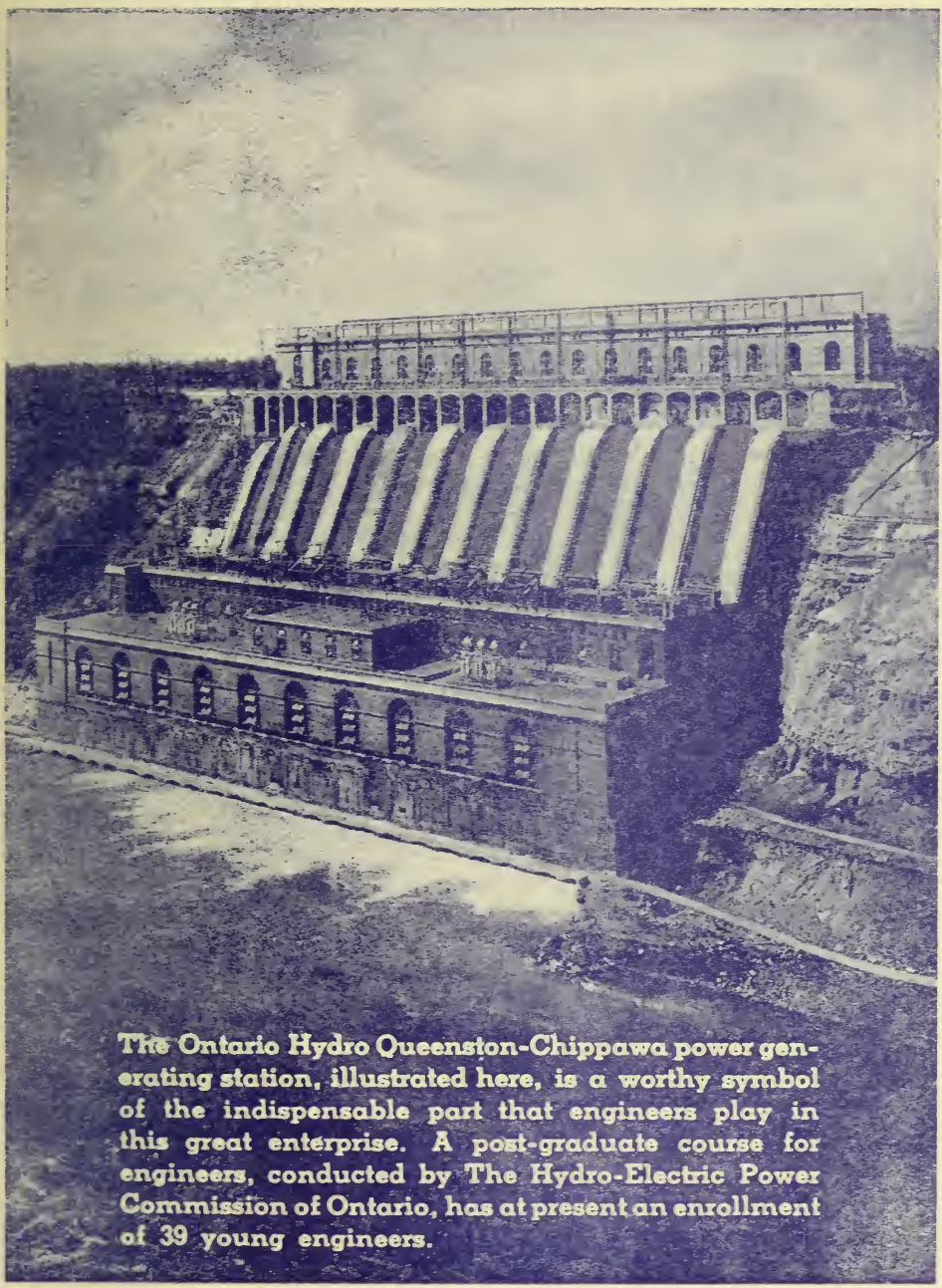

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